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ABSTRACT

Microphotography for archives advocates the use of microfilm as a means of publication. The manual is an introduction for the archivist and provides definitions of microforms, microfilm, microfiche, microcards, and microprint. The uses and the advantages or disadvantages of both microforms and microfilm are presented. The manual also reviews archival operations, microfilm equipment, and storage and maintenance procedures of original negatives. (MM)

INTERNATIONAL COUNCIL ON ARCHIVES

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MICROPHOTOGRAPHY FOR ARCHIVES

by

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PREFACE

This brief manual has been developed by the Microfilming Committee of the International Council on Archives to advance the use of microfilm as a means of publication with the hope that many archival institutions that are interested in facilitating access to their records for scientific and scholarly researchers as well as in preserving the records themselves will find it of value.

This manual is an introduction for the archivist rather than an exhaustive treatise. It has not been designed to be a guide for the technician although even he should find it useful. The cameras, readers, and other equipment illustrated are intended primarily to acquaint archivists with types of equipment. Items shown are not necessarily recommended.

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MICROPHOTOGRAPHY FOR ARCHIVES

1. Introduction

Microforms

The term microform covers all forms of micro-images -- these may be transparent or opaque, and they may be in the form of film rolls of various widths and lengths, in the form of film strips, or in the form of sheets or cards of various sizes.

All microforms are reduced photographic images of documents that must be magnified on a reader or viewer in order to be read.

The microforms in use today are basically four in number: (1) microfilm, (2) microfiche, (3) microcard, and (4) microprint.

Microfilm

Microfilm may be defined either as (1) a transparent flexible material for the photographic reproduction of documents in reduced size, or as (2) a series of photographic reproductions on this medium that may be viewed optically and that may be used for making additional microfilm copies or enlarged to make eye-legible prints.

The microfilm in use today is of three types:

(1) the silver-halide emulsion type
(2) the diazo or ozalid type
(3) the Kalvar type

Emulsion film consists of a thin strip or roll of cellulose acetate, known as the base, containing a coating of light-sensitive emulsion on one side. Usually the emulsion side of microfilm has little or no gloss while the non-emulsion side is very glossy. The only permanent record films, i.e., those that have archival permanence, are the silver-halide emulsion type.

If we distinguish emulsion-type film according to the use made of the film there are four classes in all.

The first of these is the master, or camera or original negative. In this first generation copy the normal tonal values of the document microcopied are reversed, that is black writing on white paper appears on the film as white on black. The master negative if it is to be preserved as an archival copy should be used only for making additional film copies. The

only time it should be used in a microfilm reader or viewer is during the inspection process.

The master positive or security copy. In this second generation copy black ink on white paper appears on the film as a black image on a white background, that is, the microfilm copy has the same tonal values as the original text of the document that was photographed. This copy is specially prepared for use in producing a duplicate negative in case the master negative is damaged, lost, or destroyed.

The positive or reference copy. This copy, usually a second generation copy, also has the same tonal values as the original text photographed, i.e., black writing on white paper appears on the film as black on white. In the past few years, a film base made of polyester (mylar or cronar are two names for polyester), has been used by some manufacturers for making silver-halide microfilm in addition to the silver-halide positive film they manufacture on a cellulose acetate base. The polyester base film is thinner than acetate base film and is much stronger and more resistant to tearing.

The duplicate negative copy. This copy, usually a third generation copy, has the same tonal values as the master or camera negative, i.e., the normal values are reversed.

Just two years ago a new direct negative microfilm was produced by Eastman Kodak. This film makes it possible to produce a silver-halide duplicate negative from an original negative directly without going through the intermediate stage of preparing a positive print. This development makes it feasible to preserve the original negative as a "master" security copy and use the direct negative for production of positive prints.

Archivists should use only those films that are so composed and treated that the silver-halide image as well as the base meet technical standards for permanent record film. *

Ozalid or diazo type film consists of a thin strip of cellulose acetate that has a light-sensitive diazo dye either incorporated into the film base or coated on the base. When this film is exposed to ultraviolet and blue light and developed by an ammonia vapor or an alkaline solution an image is formed. With this process a negative image will produce a negative image.

Kalvar film consists of a thin strip of polyester (mylar or cronar) film that contains a diazonium emulsion. This film when exposed to ultraviolet

*Some Countries have standards for permanent record film. In the United States, for example, the U. S. Standard is identified as PH1. 28-1957. The International Standards Organization has not, as yet, recommended a standard for permanent record film.

light and then processed by heat, forms an image. With Kalvar film a negative image will also produce a negative image.

Kalvar and ozalid films are, at present, not suitable for use in a microfilm camera but only for preparing film duplicates. Neither one has been approved for archival permanence. Both ozalid and Kalvar film are generally more suitable for the reproduction of film copies from high contrast materials such as newspapers or line drawings than they are for the reproduction of archival materials.

The emulsion type microfilms, the ones suited for the reproduction of archival materials, have been especially developed. Some of the characteristics of archival grade microfilm negatives are fine or very fine grade emulsions with high resolving power, good sensitivity, enabling the reproduction in black, white, or greys, of the complete visible spectrum, and good contrast and latitude. Different emulsions are used depending upon whether the microfilm is negative or positive and whether the film is to be used in a rotary or a flat-bed camera.

Microfilm may be perforated (i.e., equipped with sprocket holes) along one edge or along both edges. Most microfilm cameras in use in the United States today use unperforated film. Some European cameras still use perforated film although the trend is toward the use of non-perforated film as the use of perforated film results in the loss of 25 percent or more of the useful area of the film. This is so because the image on the film must be kept in the area between the perforations.

Most microfilm produced today of archival materials, newspapers, and books is 35mm. on reels with a capacity of not more than 110 feet (33.53 meters). The standard roll length is 100 feet (30.48 meters) but rolls are often made shorter, or a little longer, to meet bibliographical or archival considerations. For example, it is not desirable when filming a series of bound volumes or dossiers to have part of one volume or dossier on one roll and another part of the volume or dossier on another roll. Therefore, breaks are normally made at the end of a volume or a dossier. The length of the resulting film roll will reflect this. 16mm. film is occasionally used by archives for the reproduction of card indexes and some letter size materials with good contrast between the writing and the paper base. Occasionally 70mm. or even 105mm. microfilm is used for the reproduction of large engineering or architectural drawings that cannot be microfilmed satisfactorily on 35mm. film.

During early stages of the development of microfilming when the filming of very short runs of material was quite common, microfilm was, in some cases, kept in the form of strips, especially in France. The maintenance and use of microfilm in strip form is declining sharply because of difficulties in storing and handling.

Microfilm may, however, be cut into strips and inserted in acetate jackets (Figure 1). Eye-legible identifications can be typed on the top of

each jacket and additional frames of microfilm may be added to the jacket. Jackets are useful for storing microimages of case files such as hospital records or current personnel records which are active and cumulative. They have little or no application to archives which are noncurrent and not highly active. Some acetate jackets are thin enough to be used for microfiche production.

It is also possible to take individual microfilm images and, with the aid of special machinery, mount them on aperture cards (Figure. 2) or on specially prepared punch cards which permit rapid retrieval of the information on them.

Microfiche

A microfiche consists of a number of rows of reduced images of documents produced on transparent sheets (Figure. 3). There are a number of ways in which microfiche may be made. They may be produced by inserting strips of microfilm in very thin acetate jackets, by taping strips of microfilm on clear acetate sheets, by placing strips of microfilm in a special holder, or by using a special camera known as a step and repeat camera which records images in a series of rows on a sheet of film or on a series of sheets of film. By contact photographic processes copies on silver-halide sheet film or on diazo or Kalvar sheet film can be made. Microfiche is produced in a wide variety of sizes. The most common of these are (1) 3 x 5 inches (75 x 125mm.); (2) 31/2 x 4-3/4 inches (90 x 120 mm.) -- a size quite common in Europe; and (3) 4 x 6 inches (105 x 148 mm.). The microfiche shown in Figure 3 is a diazo copy of a negative produced by a modern step and repeat camera.

Microcard

A microcard consists of a number of rows of reduced images of documents reproduced on an opaque card (Figure 4). It is produced by photographic processes.

Microprint

A microprint is similar to a microcard except it is produced by a printing process (Figure 5).

Microforms: advantages and disadvantages

Each microform be it microfilm, microcard, microfiche or microprint has its strengths and weaknesses for the reproduction of research materials. The most versatile, and best suited microform for the reproduction of archival materials has been, and is, at the present state of technological development, roll microfilm. Roll microfilm has, in fact, become standard for microreproduction in archives. While certain classes or types of archival materials can be reproduced on other microforms none of these formats can satisfactorily reproduce all of them as well as microfilm.

The microfiche or microcard has a place in the reproduction of printed, typed, or other high contrast materials such as periodical literature, pamphlets, and scientific research reports that are uniform in size, of good contrast, and that may be placed on one or at the most a few cards or sheets, and that require a fairly large initial distribution. This initial distribution can be made at a cost less than that required for conventional printing. Microfiche is being used increasingly for the reproduction of catalogs and various types of directories both in industry and government. When sections of catalogs, for example, that have been reproduced on microfiche are revised, the revisions are also placed on microfiche and dealers or other users are supplied with microfiche copies which they substitute for the outdated sections. The eye-legible titles that are prepared for a microfiche or a microcard as well as the relatively thick film or the card stock on which these microforms are produced enables the user to file them in card catalog drawers. Microforms on sheets or cards, also, are more easily mailed than microfilm. For many materials, also, an individual frame may be more readily located on them than it can be on a film roll. With archival materials, however, the microrecorder is faced with documents that are voluminous, that are rarely uniform in size, and that often vary in legibility from document to document within the same series or file. Some documents as we know, are written or printed on paper; others are written or printed on vellum or parchment; while still others, especially comparatively modern records, may be copies produced by the letterpress, the typewriter, the mimeograph, the hectograph, or other duplicating machines. Increasingly, also, different varieties of photographic or quick copies such as photostats and thermofax or xerox reproductions are finding their way into archives. Many documents contain annotations, endorsements, file references and other markings. It is, of course, not unusual to find these markings written crosswise to the main text of the document. Quite often also archival materials show evidence of age and deterioration -- inks may be faded, papers may be creased, wrinkled, torn, yellowed, brittled or mottled.

By using microfilm the archivist can generally achieve all of his purposes more economically, more efficiently, and more satisfactorily. In a sense this is demonstrated by the fact that newspapers, probably among the most difficult of all printed materials to reproduce in microform, have been reproduced satisfactorily only on microfilm. Not only have legibility problems been encountered in trying to reproduce them on sheets or cards but it has been found that it is not possible to reproduce a sufficient number of images on a fiche or card to make them competitive with microfilm even when a very large edition is produced.

Roll microfilm has greater flexibility than microfiche or microcards. A good planetary camera can readily adjust to documents of various sizes. With one such camera, the length of each frame can be made as small as 3/8 of an inch (9.5 mm.) or as large as 1-3/4 of an inch (44.4 mm.); reduction ratios can vary from 8:1 to 30:1; and the camera head can be turned to change the placement of the image on the film. This flexibility allows the efficient production of varying size images with the best possible

legibility. The modern step and repeat cameras, used for microfiche reproduction, cost many times more than a modern planetary camera, and are the only ones whose speed and efficiency approaches that of a modern planetary microfilm camera. The reduction ratios generally used for microfiche (i.e. 18:1 or 20:1) are not only too high for the satisfactory reproduction of some archival materials but the placement of images of archival materials within a grid framework is often impracticable.

Filming errors in microfiche production usually require redoing of the entire fiche; on roll film retakes may be spliced onto a roll in their proper position much more easily. Retakes are usually more prevalent in archival filming than in the reproduction of those materials suitable for microfiche or microcard reproduction.

Although good microfilm readers are usually a little more expensive than microfiche or microcard readers this cost factor is more than compensated for by the fact that a good microfilm reader generally has a larger screen to accommodate larger images as well as a revolving head that will permit easy viewing of images in all four microfilm placements. In contrast, most screens of microcard or microfiche readers are not only small but also images on microfiche or microcards that are not in right reading positions may be adequately viewed only if the fiche or card is removed from the reader, turned at right angles and reinserted. When using fiche or cards that have numerous images of this kind it is often most difficult for the viewer to avoid confusion.

Microfilm is much more suitable for copying extensive series of documents. A 100 foot (30.48 meters) roll of microfilm can contain many times the number of documents that can be contained on a fiche or on a card. The microfilm format, therefore, is more adaptable to the handling of larger units. Consequently less work is required to title and describe its contents.

There are, of course, some materials in archives that lend themselves to reproduction on microfiche or mocrocard. Among these are periodicals and pamphlets. It has been suggested by the Public Archives of Canada that microfiche could be used for the reproduction and dissemination of pamphlets as well as those publications of an archives itself that are pamphlet-length and that are out of print.

Initial production costs of preparing acetate jackets, aperture cards, microfiche, and microcards are so much higher than microfilm that on economic grounds alone it would be difficult to justify their use for archival materials.

Almost without exception archives have limited their use of microforms to roll microfilm for the reproduction of archival materials. It is recommended that this practice be continued.

In view of the foregoing this manual will be limited to a discussion of the use of roll microfilm.

II. USES OF MICROFILM

Since the first practical microfilm camera was developed in 1928 microfilm has become more and more versatile. The most common uses by archives are as follows:

1. Reference (Le microfilmage a but scientifique). The purpose is to provide the researcher with exact copies of documents at a cost far less than the cost of transcribing, typing, or photostating the originals. In its simplest form reference microfilming is a substitute for note-taking and the scholar or requesting institution receives a negative microfilm copy. Reference filming may also involve the filming, on order, of a complete segment or complete segments of one or more series, an entire series, or even several series of records. Because of repeated requests for the same materials, some repositories now reserve to themselves the right to substitute a positive microfilm copy in place of the negative. This is usually done when the reference request is made for a straight run of materials. The negative may then be used to prepare positive prints to meet other reference requests. This is, in effect, a crude form of publication. The retained negative may, of course, also be used for security, preservation, or disposal purposes.

2. Publication. Facsimile copies of series of records can be published in their entirety on microfilm at far less cost, more rapidly, and with less editorial labor than is needed for letterpress publications. A crude form of microfilm publication is, as stated above, simply the retention of a master negative and the preparation from it, on request, of a positive copy.

Appropriate title pages, an introduction, a table of contents, and often indexes and special lists are filmed with the records to facilitate the investigator's use of the film; a guide to the records filmed or an accompanying pamphlet is printed and lists of microfilm publications are distributed and notice of the availability for purchase of the materials is disseminated.

The term "microfilm publication" is now current in the United States and in other English speaking countries but relatively new to many other countries.

3. Acquisition (Le microfilmage de complément). This is defined as the filming of records in other depositories or in private possession to supplement and strengthen one's own holdings, to preserve the information in them, or to obtain security copies. Some depositories have active programs and send teams of their own staff into other depositories to film records, or they borrow the records for filming in their own laboratory.

The depositories that purchase or obtain film copies produced by other depositories are not doing aquisition filming, strictly speaking.

4. Security (Le microfilmage de securité). Security filming is done to provide insurance against the loss of valuable information in the records in the event that the records themselves should be destroyed by fire, flood, war, or other calamity. Security fiim copies should be stored, preferably, in a depository located in a different city from the one which the original records are kept.

5. Preservation. Preservation filming is done for two reasons: (1) to protect records against possible deterioration from use, that is to say, against wear and tear, and (2) to preserve the informational content of records against deterioration and eventual loss. For example, records produced on poor materials, such as highly acid woodpulp papers or non-permanent quick-copies, or records that are faded, brittle, charred, or watersoaked can be transferred onto microfilm. This can be done at a fraction of the cost required to laminate them. Lamination can then be reserved for records that have intrinsic values or that do not lend themselves easily to microfilming, such as documents (1) that contain very fine writing, (2) that are oversize, (3) that are in color, or (4) that have very poor contrast between the reading matter and the paper.

6. Space-saving or disposal (Le microfilmage de substitution). A considerable saving in space can be achieved by microfilming records and disposing of the originals. At least two microfilm copies are generally prepared--a master (or camera) negative and a positive. The filming of permanetly valuable records for disposal purposes alone is, almost without exception, too expensive. In general only the very low-cost projects (i.e., 16-mm. copying of relatively uniform materials with low preparation costs that permit relatively high filming production rates) can be justified on a strictly dollars and cents basis. For example, in the United States, the yearly interest alone on the capital outlay for microfilming most archival series will usually exceed the yearly cost of maintaining these records in a records center. Some archives do microfilm for space-saving purposes. In most instances they do this because they simply do not have space to store the originals or they are also achieving other filming objectives.

A number of factors other than cost of preparing materials for filming and the filming itself should be considered in any disposal filming project. A few of these are: (1) the effect on reference costs (i.e., will the film raise of lower reference costs), (2) the expense of additional microfilm readers, and (3) the generally higher cost of obtaining eye-legible enlargments (on paper) from the film than from the original records.

An important consideration in space-saving or disposal microfilming is whether other objectives of filming, such as preservation, security, or publication, can be achieved.

7. Administrative or facilitative uses. Some series of records, for example, may be more easily used and the costs of reference service reduced by making microfilm copies of indexes, lists, or other finding aids to records when the original finding aids are required in the agency of origin, in another repository, or in two or more widely separated locations in a repository at the same time.

In the case, also, of self-indexing files of bulky dossiers that contain listings or descriptions of their contents on the covers of the dossiers, an index on film may be created by filming the dossier covers. Such an index may reduce reference to the dossier itself or it may expedite or reduce the cost of servicing the records. Another example, of an administrative or facilitative use is as an intermediate step in the preparation of microcards or microfiche or in the preparation of full size or slightly reduced copies of originals by the xerox copy flow process.

Microfilm may also be a part of the actual recording process.

III. DISADVANTAGES OF MICROFILM

Despite its significant uses microfilming should not be looked upon as a panacea for solving all problems for it has disadvantages as well as advantages. Some of the disadvantages of microfilming records are:

(1) the cost of maintaining and servicing records in microfilm form may be more expensive than storing and servicing the originals;
(2) the microfilm copy may be inconvenient to use;
(3) it is not always possible to obtain a perfectly legible or usable microfilm copy (a) when a document contains very fine writing, (b) when a document is exceptionally large (c) when there is extremely poor light-reflecting contrast between the reading matter and the paper, as in the case of some yellowish or faded inks or discolored, darkened, or colored paper, and (d) when the interpretation of a document depends upon color as a distinguishing element;
(4) the intrinsic value of a document is lost in the film copy;
(5) it is not possible to compare two separate images on the same roll;
(6) once records have been filmed it is not always feasible to incorporate additional material in the film;
(7) there is a danger that disposal microfilming will be used as a substitute for a thorough appraisal of records; and
(8) unless quality standards are carefully followed the microfilm produced may not serve its purpose.

IV. MICROFILM EQUIPMENT

Many of the microfilm cameras, readers, reader-printers, and accompanying accessories that are now produced are listed and described in several guides and supplements thereto published by the United States National Microfilm Association and by the International Microphotographic Congress. This manual will only describe some of these. Examples of basic equipment are reproduced as illustrations.

1. Cameras. The cameras used in microfilming are of two basic types, the flatbed and the rotary. Although each type is described and illustrated there are many variations including portable rotary and portable flatbed cameras.

a. The Flatbed Camera (Figures 6 and 7). In this type of camera also called a planetary or an overhead camera, both the film and the document being photographed are stationary during the exposure. The camera equipment consists primarily of a table, a set of lamps, a camera unit mounted on a vertical track, and an electrical control system. The work of positioning the document, moving the camerahead upward or downward to adjust the field and the reduction ratio, adjusting the light intensity, operating the camera shutter, and removing the document from the field, all are generally done by hand although automatic exposure meters and motor driven devices to raise and lower the camerahead are becoming more popular. The flatbed camera, generally used for the copying of most archival materials, can handle bound volumes, oversize records (such as maps and charts), and fragile records as well as newspapers. It will produce a film image superior in quality to an image produced by a rotary camera as the image is not in motion during the filming process. Most flatbed cameras use 35mm. film although by use of an adaptor it is possible to use 16mm. film. Reduction ratios on some vary from as low as 5:1 to as high as 30:1.

b. The Rotary Camera. In this camera (see Figure 8) both paper and film move in synchronism during the exposure. The name "rotary" is not precisely accurate for in some models the paper filmed moves on a horizontally traveling belt rather than a rotating drum. Since the document is photographed as it passes a narrow slot or aperture, cameras of this type are occasionally referred to as "flow cameras." The term "rotary", however, is in general usage.

A rotary camera consists basically of a camera unit, a paper moving and guiding mechanism, and light controls, all of which are enclosed in a light-tight cabinet. Documents are fed into the camera, either by hand or by an automatic feed attachment, through a slot in the front of the cabinet.

The width of this slot varies in different models from 9-1/2" to 17" (23.7 x 43.2 cm.) with most cameras equipped with 11" or 12" (27.9 or 30.5 cm.) slots. The maximum width of a document that can be filmed is determined by the width of this slot. Documents of almost any length can be photographed as they move around the drum and across rollers which guide the document past the camera lens. The camera does not have a shutter. As the document passes under the lens it turns the lights on and off automatically. The intensity of the light can be varied on most machines by simply turning a knob or by pressing one of a series of buttons.

Most rotaries use 16mm. film although there are some which use 35mm. film and others which will use both sizes of film. Some rotaries will photograph only one side of a document (standard method); others will photograph both sides simultaneously side by side (duplex method); others will photograph documents on one-half the width of the film and others on the other half (duo method); still others will photograph two rolls of film simultaneously at the same time that both sides of a document are being filmed (triplex method). The duplex, duo, and other rotaries are able to perform as they do because of mirror systems.

The most suitable type of material for filming with rotary cameras are checks, index cards, and letter size papers of uniform sizes in a good state of preservation and of good light reflecting contrast. The filming by rotary cameras of other archival materials is generally not recommended because of the difficulty of producing film copies meeting archival standards. Most rotary cameras now being manufactured, for example, will produce film only at reduction ratios of 20:1 and greater with reduction ratios of 30:1 and 40:1, becoming more common. Cameras with these high reduction ratios are more suited for the reproduction of current business records than they are for archives.

Filming Accessories (for 35mm. flatbed cameras)

Many documents, especially those that are folded, creased, or bound in volumes require the use of special holders or devices. The United States National Archives uses a special book cradle (Figure 9). This resembles a wooden box with a hinged top of plate glass. Inside the box are two adjustable platforms, one to support each side of a book so that the pages will be level when the glass top is closed. An improvised book holder is shown in Figure 10. Sponge rubber pads of varying thicknesses are placed under the two sides of the book to insure that the pages will be level when the glass is placed on top of the holder.

A numbering machine or an automatic electric counter is worth acquiring. Some archives follow the practice of stamping each page or folio of a series of records that is to be filmed with consecutive numbers; others install automatic electric counters on the camera bed or in the book cradle. By either method the numbered pages, folios, or images produced facilitate reference to the film.

Readers

A microfilm reader is a projection or viewing device used to magnify the microfilm image to readable proportions.

The principal characteristics of a good microfilm reader are (1) a lens capable of magnifying the film image to at least the approximate size of the original with excellent definition and without noticeable differences in sharpness between the center and the corners of the image (2) an easily replaceable light source that will provide proper illumination and will not damage the microfilm (3) the screen should minimize the effect of light sources in a room and it should be so tilted that a viewer may see the image easily and comfortably (4) the screen should be large enough to project an entire film image; if not, provision should be made for scanning the film (5) both 16 and 35mm. film of 100 foot (30.48m.) lengths should be handled (6) the loading of the film roll on the reader should be easy and a relatively simple mechanism should permit winding and unwinding of the film easily (7) provision should be made for rotating the image on the screen (8) all other controls should be readily accessible (9) the reader should minimize the possibility of abrading and scratching the film, and (10) means should be provided for preparing enlargements easily.

In most readers light from an incandescent lamp passes through the film, held flat by plastic or glass plates, and is focused by a projection lens on a viewing screen, either translucent or opaque. Figure 11 shows how the light is projected onto a viewing screen in a reader. Figure 12 is an example of a reader with an opaque reading screen (size 20" x 20") (50.7 x 50.7cm.). This reader keeps film in constant focus and magnifies the film image 19 times. Figure 13 shows a reader with a translucent screen. Magnification is adjustable from 12 to 23 times through use of a movable screen (size 18" x 18") (45.7 x 45.7cm.) and the image remains in focus while the magnification is being changed. The two readers shown in Figures 12 and 13 will handle both 16 and 35mm. film; screen size is 14" x 14" (35.6 x 35.6cm.); the image may be rotated on the reader; and a variable lens provides magnification ratios of 23x through 36x. This type of reader is preferred by some film inspectors.

A number of fairly low cost portable microfilm readers are on the market but they are more appropriate for use by an individual scholar than by an archives or research institution. One of the most adaptable of these portable readers (Figure 15) weighs only 22 pounds (10 kg.) including its carrying case. Although this reader is designed primarily for desk top reading on a "flodaway" opaque screen it may also be used for projection on vertical screens or light colored walls for group reading. This reader is equipped with a rotating projection head and a scanning device; its screen measures 14" x 14" (35.6 x 35.6cm.); and it will handle both 16 and 35mm. film. Different lenses are available at magnifications of 17x 23x, 30x, and 43x.

If most microfilm readers are adequately maintained and used cor-

rectly there is no reason why film should ever be scratched or damaged during the viewing process.

The following steps should be followed in loading most microfilm readers:

(1) Place the square hole in the side of the reel on which the film is rolled, over and through the square spindle of the reader (located on the left-hand side of the head of the reader);
(2) Unwind about 6 inches of the film from the roll with you hand (the reel should unwind counterclockwise), thread the leading end between the rollers if there are two, or over the roller if thereis one, and through the guides or optical flats (two pieces of glass which keep the film in position) to the slot in the empty takeup reel on the other spindle;
(3) Wind the film on the takeup reel about a half turn;
(4) Turn the winding handle of the reader slowly at first to be sure that the film is moving properly and that you are turning it in the right direction; and
(5) Turn the head of the reader, if necessary, so that the image is in reading position and adjust the focus.

In taking care of a reader and the film the user should:

(1) Arrange, if service is available, for a regular check by a good serviceman.
(2) Regularly clean all parts of the reader in contact with the film, using a clean , soft, lint-free cloth. Dirt in the reader is the chief cause of film abrasion.
(3) Inspect rollers, particularly plastic ones, for rough spots which might scratch the film. Make sure that the rollers rotate freely.
(4) Test the reader regularly for tendency to scratch by threading it with a strip of clear microfilm about 5 feet (1. 5m.) long. Winding and rewinding this strip a few times will reveal any abrasion. Be sure to use film free from scratches each time the test is made.
(5) To keep the film clean touch only the leading or trailing ends, and especially avoid touching the emulsion. Even clean hands will deposit small quantities of oil, which are difficult to remove.
(6) Remove only one roll of microfilm from a container at a time. When you have finished using a roll of film replace it carefully in its container.
(7) Keep the working mechanism covered with a plastic hood when the reader is not in use.

Microprints

There are a number of different methods to obtain enlargements from one or more frames of 16 or 35mm. microfilm. Many microfilm readers can be used or adapted to prepare microprints or enlarged hard copies of film frames. One of the easiest film readers to use in this way is the one shown in Figure 16. A sheet of special photographic paper is simply placed over the viewing screen and the image exposed, usually for about 12 to 15 seconds, depending upon the film density. The special photographic paper is not permanent but it does not require the use of a darkroom.

Many archives and libraries use standard or special photographic enlargers for preparing prints of one or more microfilm frames. Figure 17 shows a special microfilm enlarger which will handle rolls of 16 and 35mm. film and prepare enlargements up to 75" x 105" (190.5 x 266.7cm.). Enlargements made on equipment such as this usually require marking the film and sending it to a photographic laboratory for preparation of the prints.

In marking film for microprints to be made on an enlarger the following procedure is recommended:

(1) If each frame on a roll bears consecutive frame, page, or sheet numbers it is, of course, not necessary to mark the film.
(2) If there are no consecutive numbers on the film, the frame or frames to be reproduced should be marked with arrow shaped pressure sensitive adhesive labels. The labels should be placed only on the back (glossy) side of the film, never on the emulsion side, with the arrows pointing forward to the first frame to be reproduced, and backward to the last frame.
(3) The labels must be removed from the microfilm after the microprints or film copies are prepared and the order is checked. The film should then be cleaned with a non-toxic film cleaner.
(4) The use of grease pencil is not recommended.

Reader-Printers

During the past few years a number of manufacturers have introduced a combination microfilm reader-printer which enables the viewer to obtain a microprint within a few seconds. The one shown (Figure 18) handles both 16 and 35mm. rolls and unitized cards. Its features include: a series of interchangeable lenses for handling differnet image sizes; a provision for rotating the image 360°; a scanner for oversize film images; a focusing adjustment; and adjustable illumination for different lenses. In the base of this reader-printer is a monobath processor which automatically delivers a severed silver image print within 45 seconds after a button is pushed. This process produces an excellent black and white copy. Good prints may

be made from negative and positive film copies. The comparatively low price of this reader-printer is counterbalanced by the small screen (11" x 11") (27.9x27.9cm.), and print size (81/2" x 11") (21.6 x 27.9cm.), and the difficulty of changing the lenses which come in magnifications of 13x, 20x, and 28x.

Continuous microfilm printers

When enlarged copies of entire rolls of microfilm are required a continuous microfilm printer is used. The first printer of this type was developed during World War II for use with V-Mail.

The Xerox Copyflo Model Continuous Printer, introduced in 1955, will handle 16 or 35mm. film and produce excellent enlargements up to 11" (27.9cm.) wide and 2,000 feet (609.6m.) long on sulphite or bond paper. The cost of this machine is so great that most archives and libraries have their continuous microfilm printing done commercially.

V. ARCHIVAL OPERATIONS

Archival Filming

The archivist will generally only be concerned with the filming of records that have permanent values. He will, therefore, be interested in producing a film product of archival quality. Most microfilming, however, that is done today is of commercial rather than archival quality. The filming that is done for banks and department stores by most commercial microfilming organizations is usually for administrative purposes. Practically all filming of these current business records is of records of temporary value that are uniform in size, in good physical condition, and with good light-reflecting contrast between the reading matter and the paper. These records are usually in series in which the arrangement of records is a simple one. The permanently valuable records of an archives, in contrast, are usually more complex in their organization; they are usually not uniform in size, they require more arrangement work before filming, and they are often in poor physical condition. Commercial filming is low-cost; most archival filming is high-cost. Commercial-type filming is rarely suited for archival materials.

In making reproductions of archival records the integrity of the original records must be maintained. By the term "integrity of records," we mean that the film copies will be so arranged, identified, and indexed that an individual document or component of a series can be located easily and that the film copies will contain all significant record detail needed for probable future reference.

The phrase significant record detail is especially important. It should be borne in mind that the very best camera negative does not record the finest detail of the object photographed and that when a film copy is made from the camera negative there is always a copying loss, sometimes as high as 20 per cent. The permanent preservation of records through microfilming demands that the archivist produce a camera negative of the highest quality. Such a high quality negative will not only reproduce all significant record detail but it will also enable us to reproduce many years from now second and third generation prints which will also reproduce the significant record detail.

The archivist in his microfilming programs should use only safety microfilm raw stock that meets all viscosity retention and flexibility requirements. *

The emulsion of the negative microfilm should be capable of resolving at least 125 lines per millimeter as determined by a microcopy resolution test chart comparable to the one used by the United States Bureau of Standards and after processing the microfilm should contain not more than 0.005mg. of sodium thiosulphate per square inch (6.45cm^2) of film.

In resent years several types of microscopic blemishes have been found on processed negative microfilm in the United States, from 2 to 20 years after they had been placed in storage. Fortunately practically no instances of blemishes affecting the legibility have been found. Moreover, no blemishes whatever have been found on any microfilm processed by the National Archives of the United States. This indicates that if microfilm is properly processed and stored it is as stable as letterpress printing on rag paper. Extensive research to determine the cause and prevention of microspots has been carried on by the U. S. National Bureau of Standards and by industry.

It is most likely that this phenomena is caused by the local oxidation of silver in the image. The possible occurrence of these spots, according to the experts, can be prevented if microfilm is properly processed and stored. Present recommendations include avoiding excessive densities on film, careful avoidance of physical damage to the image layer, the use of a small concentration of iodide ion (potassium iodide) in the fixer, thorough washing, uniform drying, storage at low temperature and humidity in sealed cans, careful avoidance of air-borne reactants, increased use of positive copies for archival storage, and careful periodic inspection of record films. **

Selecting Records

Before an archivist decides to microfilm any specific group of records he must analyze them thoroughly as there is no simple formula that he may apply. He must be sure that he can achieve the purpose or purposes for which the filming is intended; very often he will have to consider the

*In the United States archival film contains the word safety on its outer edges as well as a triangle which means that it meets government and industry standards for permanence in accordance with United States Standard Specifications for Safety Photographic Film, PH 1.25-1957 and for Photographic Films for Permanent Records PH 1.28-1957 or the latest versions thereof.

**U. S. National Bureau of Standards. Technical Note 261. April 16, 1965. C. S. McCamy and C. I. Pope. "Summary of Current Research on Archival Microfilm." p. 1.

relative advantages, disadvantages, and costs of filming different series of records.

In determining the relative suitability of records for filming the physical characteristics of the records should be taken into consideration. Microfilming is particularly suited for:

(1) voluminous records, especially large series.
(2) records that are arranged in rational order and whose order has been perfected. In general, the simpler the arrangement the better the records lend themselves to microfilming. Simple chronological, numerical, or alphabetical files are easier to film, for example, than records arranged under a complicated system such as decimal files. If records are not arranged in an easily intelligible system they should be rearranged before filming.
(3) records that are flat (not folded), that are of uniform or nearly uniform size and whose paper and inks are of uniform shade and color.
(4) records in good condition as these can be microfilmed more easily than those in a poor state of preservation.

Microfilming is not particularly suited for records that are subject to accretions especially when these additions will be made at various points within a body of records. Once records are filmed it is not feasible to incorporate additional materials in the film.

In selecting records for microfilming it is generally more economical, more efficient, and better archival practice to film an entire series of records or a significant sub-series than it is to film only selections. The major reasons for this are:

(1) The filming of selected items from a series will often destroy the integrity of a series (i.e, the interrelationships that one document has to others in the same series).
(2) The selection of specific items often involves value judgments--the filmed selections, therefore, tend to be subjective rather than objective, thus giving the user an imperfect or distorted picture of events.
(3) Selective filming is generally unsatisfactory. Scholars are disturbed by it and some even believe that those making the selection are acting as censors. It often leads to requests for, and the refilming of, a series in its entirety. Archivists and historians alike will rarely agree on the same criteria of selection. Selective microfilming projects, moreover, have been subjected to much criticism.
(4) It is cheaper and easier to microfilm an entire series than it is to select items for filming from that series.

There are, of course, cases when selective filming can be justified but these are usually the exception. For example, the selecting and filming of specific kinds of documents such as royal orders, presidential proclamations, annual reports, laws, etc., when they are scattered throughout one or more series is often justified. Similarly if certain documents in a series are classified or restricted in their use the archivist cannot film them for the researcher unless the restrictions are first removed. In some cases, also, because of special considerations, such as restrictions or the comparatively low research value of a part of a series, it is often practical to terminate reference or publication filming of a series at a specific point or date.

The rationale behind the microfilming of records for acquisition and space-saving purposes has probably been dealt with sufficiently in our definitions of these terms which appear earlier in this manual. It is hoped that archives in order to make their records more accessible for scientific research will give serious consideration to supplying positive copies of records microfilmed for preservation or security purposes to researchers when the records filmed do not have legal restrictions against their use.

As microfilm is an economic and rapid method for the preservation and publication of archival sources it is believed that the development of guidelines for projects having these purposes would be useful. This is especially true for microfilm publication. It should be remembered that the ICA Constitution defines as one of its purposes the facilitating of the use of archives and their more effective and impartial study by making reproductions of them more readily available.

Some archives when they handle reference requests for fairly long runs of material now retain the microfilm negative and supply the researcher with a positive copy. The negative may then be used to make other positives when similar requests are made in the future. This practice not only avoids repeated filming, saves time and money, and preserves records from repeated handling but it can also provide the basis for a microfilm publication program.

In the National Archives of the United States the following guidelines for selecting entire series of records for microfilm publication are used:

(1) The records selected should have a high research value for a variety of studies. The interest that researchers have shown in the records, the archivist's own knowledge of their value, and current and possibly future research trends are all factors.
(2) The ratio of research value to the total volume of records should be high.
(3) Most of the information in the records should not already be available in published form.
(4) Series of records that are directly related to each other should be published in close succession, if possible. If

a series of records is selected for publication because of the subject other records equally pertinent to the same subject should be considered for selection.

(5) In general, the most needed microfilm publications are of those series that supply adequate documentation of a significant activity or that are limited to specific geographic areas of current or prospective research interest.

(6) The series should not be subject to further accretions as it is not feasible to incorporate documents in the microfilm unless the documents can be added to the film as a continuation of the series.

(7) Records whose use is restricted should not be published on microfilm if their publication would have the effect of nullifying or violating the restriction.

(8) The arrangement of the records should be considered. Records should generally be in such a state of arrangement so that they can be easily used in microfilm form. If not, consideration might be given to rearranging them if the time and labor involved is not excessive.

(9) The physical state of records and whether or not they have to be rehabilitated is important. Records that are to be filmed are put in such a condition that careful handling by camera operator will not damage them.

(10) Records are filmed only when a legible microfilm copy can be obtained.

(11) If security and preservation purposes can be achieved as by-products of the filming these factors should be given proper weight.

The National Archives of the United States has closely linked its microfilm publication program to its own preservation microfilming program. That is to say the two programs are combined operations. The primary purpose of preservation filming is to make copies of permanently valuable series of records available for use when a series is (1) not available for use because of its extremely fragile condition, (2) in grave danger of deterioration or disintegration if it is continually used by researchers and staff, (3) if frequent microfilm, photostat, xerox, or other reproductions are being made of selected items, thereby subjecting the records to excessive wear and tear, and (4) if many of the individual documents or papers in a series are not relatively permanent and will eventually disintegrate because of the physical characteristics of the records themselves, e.g., highly acid wood pulp papers.

In selecting records for preservation microfilming consideration should be given to the relative frequency of use of the records as well as their historic value. Priority, of course, should be given to those records that are most active and most valuable.

Series of records can be microfilmed at a cost far less than that of lamination or silking. This is especially true of bound volumes where

binding edges have to be added to laminated or silked pages. If it is essential to maintain the volume format it is still far less expensive to prepare and bind xerox copies produced on a continuous Copyflo printer. Points (6), (7), (8), (9), under microfilm publication guidelines as discussed above are also applicable to preservation microfilming projects.

Arranging Records

Before series of records are filmed it is imperative that the arrangement of the records be perfected. Occasionally, even though a body of records may be in perfect order, it is necessary to alter its arrangement to produce a microfilm copy that can be easily used. In general, the following rules are also applicable:

(1) Indexes, register, lists, and other finding aids should be filmed before the records they govern. Thus indexes or registers at the end of a volume are filmed before the records in a volume.
(2) Blank pages should not be filmed.
(3) Endorsements, numbers, and other data appearing on the back of individual documents should be filmed before the text of the document.
(4) Enclosures should be filmed immediately after letters of transmittal.
(5) Guide cards and folder labels should not be filmed unless the information on them is essential to the user of the film.
(6) Duplicate papers, disposable items, or records of no research value should not be filmed if they can easily be separated from the records or if they may be so identified that the camera operator will not film them.
(7) Since documents in a folded file (such as those folded in thirds with enclosures also folded in thirds) are apt to become disarranged or lose their relationships if they are unfolded or flattened before they are filmed it is usually best to have them unfolded and refolded by the camera operator. One method for filming records of this type is shown in Figure 19.

Processing Records

To properly prepare records for the camera it is often necessary to process the records before they are filmed. This is especially true when a large volume of records is involved. Processing may include one or more of the following: flattening, humidification, unbinding of volumes, lamination or taping, and the removal of staples, clips, pins, or other fasteners. The repair of records prior to microfilming is usually kept to a minimum as microfilming is a preservative measure.

Division into Rolls

After records are properly arranged and processed they should then be divided to correspond to projected microfilm rolls.

This should be done carefully as proper roll breaks will make the final product more usuable. Whenever possible these rolls should be about 100 feet (30.48 meters) long but they should never exceed 110 feet (33.5 meters). The filing arrangement and subject matter will usually determine the dividing points. The following principles also should be observed where they are applicable:

(1) In straight chronological series of unbound records the breaks should be made systematically - at the ends of years, half-years, quarters, or months.
(2) In unbound records arranged alphabetically the breaks should be made, if possible, between letters of the alphabet.
(3) In series of bound records or case files the breaks should be made at the end of a volume or case file.
(4) The number of images that can be placed on a 100-foot (30.48 meters) roll of film varies with the degree of reduction, the size of the record, and the placement of the image on the film.

a. Reduction is the ratio of a linear dimension of the object to the corresponding dimension of the image on the film. Thus, if a document is twelve inches long and the corresponding dimension on the film is one inch, the rate of reduction is 12 to 1. This ratio is also expressed as a reduction of 12 diameters, reduced 12 times, or sometimes as a 12X reduction. A graphic illustration of the effect of reduction ratio is given in Figure 20. The reduction ratio is a most important factor in the legibility of the microphotograph as well as in the cost of film used. For most archival materials reduction ratios from 12 to 1 to 15 to 1 are the rule rather than the exception.

b. The maximum size of records which can be photographed on 35mm. unperforated film is shown in the following table:

Reduction Ratio	Maximum size (in inches)	(in centimeters)
8:1	14.0 x 10.0	35.6 x 25.4
10:1	17.5 x 12.5	44.4 x 31.7
12:1	21.0 x 15.0	53.3 x 38.1
14:1	24.5 x 17.5	62.2 x 44.4
16:1	28.0 x 20.0	71.1 x 50.8
18:1	31.5 x 22.5	80.0 x 57.1
20:1	35.0 x 25.0	88.9 x 63.5
22:1	38.5 x 27.5	97.8 x 69.8
24:1	42.0 x 30.0	106.7 x 76.2
26:1	45.5 x 32.5	115.6 x 82.5
28:1	49.0 x 35.0	124.4 x 88.9
30:1	52.5 x 37.5	133.3 x 95.2

As considerable difficulty will be encountered in filming many over-size documents with the larger reduction ratios it is often necessary to use lower reduction ratios and film a document in several overlapping segments.

c. There are four different ways in which to position an image on the film. These follow the nomenclature of the United States Standards Association and those of many other countries and are shown in Figure 21. In placement IA, we see a single page arranged lengthwise on the film with the writing lines at right angles to the edges of the film; in placement IB a single page is arranged with writing lines parallel to the edges of the film; IIA is a double page with writing lines at the right angles to the edges of the film; and in placement IIB we see two pages, side by side, with the writing lines at right angles to the edges of the film.

d. The number of images that can ordinarily be placed on 100 feet of 35mm. film can be computed from the following formula:

$$\frac{\text{No. of reduction} \times 1200 \text{ inches}}{\text{of document} + 0.5 \text{ inches}} = \text{no. of images per inches 100 feet of film}$$

Thus, if documents 8 x 11 inches are microfilmed at a reduction ratio of 14 diameters (in position IB), the above formula would be applied in the following manner:

$$\frac{14 \times 1200}{8 + 0.5} = \frac{16,800}{8.5} = 1977 \text{ images per 100 feet}$$

Insert Pages or Targets

The conversion of paper records of film changes the physical form of the records. Appropriate identification or targeting, therefore, is nec-

essary so that the film may be easily used. These identifications should include a title page or title target containing, for each film roll, the identification of the series; the number of the film project; the number of the film roll; a brief identification of the contents of the roll (i. e. the volume numbers, inclusive dates, or other comparable data); the standard imprint of the institution, and the year filmed. Targets are also used to identify or to separate documents or groups of documents on the film. For example, they are used when volume identification, folder labels, file guides, and other identifications necessary to the used of records cannot be filmed. They are also used to indicate lacunae within a microfilmed series of records.

Carton Identification

Each microfilm roll should be adequately labeled. The carton label usually on gummed paper, should contain for each roll: the series title and number, a brief identification of the contents, and the roll number. Negative film should be distinguished from positive microfilm. The National Archives of the United States uses different color labels for positive and negative film. A sample of one of these labels is shown in Figure 22. Some archives type or print the words negative and positive on the label.

Describing Microfilm

In order for the researcher to be able to use materials that are microfilmed, these must be, at the very least, described and listed. A number of archives have prepared listings of the materials they have microfilmed or which they have obtained from other archives. Some archives have prepared inventories of their film while others key their film into existing inventories or finding aids.

In the United States where microfilm publications have been produced since the early 1940's by the National Archives and by other private and public institutions since 1946 it is now common practice to prepare special descriptions of records microfilmed for publication purposes. The purpose of these is to facilitate use of the microfilm publication by the researcher and to anticipate all or most of the questions that he might raise. It is true, of course, that many records have come down to archivists about which very little is known. In these cases, of course, descriptions must, of necessity, be brief. The National Archives of the United States uses the following guidelines for use by an archivist preparing descriptive introductions for records that are to be microfilmed for publication purposes:

(1) The introduction should give the number of rolls comprising the publication and a brief description of the records reproduced, their physical form, their coverage, and their arrangement. It should also mention any finding aids that relate specifically to the records filmed.

(2) If the records filmed are a selection from a series or several series the exact criteria governing this selection and data on how the selection was made should be described.
(3) A list of the records reproduced on each roll (a recapitulation of the data on the target sheets that are inserted to mark the beginning of each volume or other comparable unit on the film is prepared).
(4) All information about the agency's history and functions that is necessary for an understanding of the records filmed is given.
(5) A brief statement about the types or classes of the records filmed, their subject matter, and their value for purposes of research is included.
(6) If necessary for an understanding of the records, the introduction should include detailed statements about the arrangement of the records, their history, and any differences between the arrangement of the paper records and that of the microfilm publication.
(7) If any of the volumes, papers, or documents found in a series of records have not been microfilmed because they are duplicates, have little research value, or have no evident relation to the series, a statement to this effect should be included.
(8) The introduction should include a statement identifying the microfilmed records in relation to their record group, subgroup, and archival series and providing information on closely related records have been or are being microfilmed, reference should be made.
(9) The introduction should also include a statement on any closely related records in other record groups in the archival repository, when such records are known to the compiler or can be readily identified.
(10) If the information is readily available, the introduction should include a reference to closely related materials that are not in the repository.
(11) If there are no adequate finding aids covering the records filmed and if the character and high research value of the records warrant it, a special list or description may be prepared and inserted after the introduction.

The National Archives of the United States as well as other repositories usually prepare and issue a printed guide or accompanying pamphlet for each microfilm publication. This contains the introduction as well as any other finding aids such as indexes and tables of contents that are specially prepared for the publication. Some archivists consider these printed guides or accompanying pamphlets to be an essential part of any microfilm publication.

Microfilm Publication and Letterpress Publication

One of the major tasks of an archivist is to make records more accessible to historical researchers. One of the ways this may be accomplished is by the publication of documentary sources by the conventional method of letterpress printing. The advantages of letterpress are that the volumes produced are most convenient for scholars to use, they can be made available to a large number of readers depending upon the size of the edition, the cost per printed volume decreases in rough proportion to the number printed, and the editors or compilers receive professional recognition for their product. Some of the major disadvantages of conventional letterpress publication is that production is slow and that the cost of preparation and publication is continually rising. In Great Britain, for example, the Keeper of the Public Record Office estimated that "at least two years work is required to prepare each volume of documents at a cost of about £5,000."*

In the United States where costs are higher and where documents are often obtained from a number of repositories it is estimated that the major non-governmental publication projects require from $35,000 to $55,000 a year for editorial costs alone.**

According to Gh. A. Belov, "The high cost of printing and the considerable labor and money spent on preparing publications face the archivist with the need to reduce expenses and to find other similarly convenient but cheaper ways of publishing documents."***

An editor of a conventional publication has to perform to following functions and many of these are often complex: (1) to search for relevant documents, (2) to assemble them, (3) to establish controls over them, (4) to select those he desires to publish, (5) to transcribe these, (6) to type and collate them, (7) to annotate them, (8) to arrange them for publication, (9) to mark copy for the printer, (10) to read proof, not just once but several times, (11) to prepare an index, (12) to see his product through the press.

Most of these steps can be eliminated through the only real alternative to conventional publication -- publication on microfilm. Through this process scholarly access to large quantities of documentary materials is possible, for microfilm publications can be produced quickly and at but a fraction of the cost. The edition is definitive as complete series are re-

*Belov, Gh. A. "National Programs for the Publication of Documents in Countries of the Eastern Hemisphere." English Version, p. 15. Paper prepared for the Extraordinary Congress of the International Council on Archives. May 9-13, 1966.
**Holmes, Oliver W. "National Documentary Publication Programming: Documentary Publication in the Western Hemisphere." p. 18. Paper prepared for the Extraordinary Congress of the International Council on Archives. May 9-13, 1966.
***Belov, Gh. A. op. cit. p. 15.

produced and the editor need not resort to selective publication which often is disturbing and unsatisfactory for many researchers. The user is provided with facsimile reproductions of the original documents and the edition is always in print as a positive microfilm copy of the master negative may be produced on order.

Through a microfilm publication access to very large quantities of documentary materials is possible; through conventional publication it is practically hopeless.

Through microfilm publication it is also possible for an archivist, if he is concerned with other archival problems, to obtain security copies of records, to preserve the originals from destruction through deterioration or through excessive use, and, if he so desires, reduce the volume of holdings. Conventional publication cannot begin to achieve these objectives.

Microfilm publications do have their disadvantages. Editions are smaller and generally more expensive to the purchaser; there is still prejudice against their use; a reader or projector is required; and some archives do not have the equipment or technological knowledge to produce good ones. In some cases archivists are inclined to believe that it is not possible to obtain satisfactory microfilm copies of documents that are faded or in poor condition; the contrary is more often true. The excellent film and cameras now available can adequately reproduce the most difficult materials.

The implication should not be drawn from this discussion that microfilm publications should supplant conventional publications. Both have their place in a well-rounded documentary publication program of a major archival repository. Letterpress, however, should be reserved only for the publication of documents of the highest value that require the widest possible circulation. At the time this manual was prepared major documentary publication programs of national archives utilizing both forms of publication were in operation in the Soviet Union, Great Britain, and the United States.

Not to be overlooked is the combination documentary publication project which uses both letterpress and microfilm. For example, it is possible to publish a selection of documents accompanied by a microfilm supplement containing all of the documents from which a selection is made. A refinement of this would be to make direct references in the published volume to materials reproduced in the supplement by roll and page number. This combination is becoming more and more feasible as printing costs rise and as editors become more and more dependent upon microfilm as a tool for collecting the documents they are to edit. With this combination, also, it becomes possible to cut down on the number of needed annotations because every document printed is reproduced in facsimile in the microfilm supplement.

VI. STORAGE AND MAINTENANCE

Special attention must be paid to the archival storage and maintenance of original negatives.

Microfilm - a more delicate medium than paper records - is, if not properly processed and preserved, much more susceptible to deterioration. The microspot danger has already been discussed. Excessive humidity may result in the growth of mold or mildew. A microfilm image may be made almost illegible by a spot of mold that could hardly affect the legibility of a document. There is also reason to believe that mold, once it has gained a foothold on a film emulsion, will grow more rapidly than it will on paper. Cellulose acetate film, being hygroscopic, is quite sensitive to moisture changes.

The comparative small bulk and the great value of original negatives do merit the best possible storage conditions. Protection should be provided not only against climate but also against impurities in the air, fire, water, and vermin. Minimum archival storage conditions for microfilm are a filtered air-conditioning system which will maintain a temperature between 65° and 70° Fahrenheit (18.3° and 21.1° C.) and a relative humidity of about 40 per cent. High relative humidities encourage the growth of mold or microspots; low relative humidity, below 30 per cent, can make film brittle.

The accepted practice is to maintain both negative and positive microfilm in lengths of not more than 110 feet (33.53 meters) on reels. Longer lengths are unwieldly and may not fit into standard containers. The reels themselves should be made of non-corrosive materials such as non-ferrous metals or stable plastics that are free of peroxides. The most versatile reel, known as a universal reel, has square sprocket holes at each end. A slit running from one side to the core of the reel as shown in Figure 23 facilitates winding of the film. The best container for storing negative film is a can made of non-ferrous metals or a ferrous one coated with tin (Figure 24). The lid should be tight. Cardboard containers may be used for the storage of negative film only when they are relatively acid free and non-peroxide producing. The containers should be stored in metal cabinets or drawers that will permit circulation of air. No film should be stored within 4 inches of the floor.

In addition to the can recommended for the storage of master negatives there are a number of different types of cartons available for film storage of individual reels. These are made for both 16 and 35mm. The 35mm. box has outside dimensions of 1-7/8" x 3-7/8" x 3-7/8" (4.7 x 9.8 x 9.8 cm.) while the 16mm. box measures 1" x 3-7/8" x 3-7/8" (2.5 x 9.8 x9.8 cm.). Those shown in Figure 25 are knock-down or collapsable cartons which are

delivered flat but which can be assembled in seconds. Figure 26 shows a clam-shell or hinged-lid box with metal re-inforcements on each corner. This type of box will wear longer than the box shown in Figure 25 and will afford greater protection to the film reel. Figure 27 shows a metal-reinforced cardboard container suitable for the storage on shelving or for shipping of six 35mm. boxes or ten 16mm. boxes. This box measures 4" x 4" x 10-3/4" (10.2 x 10.2 x 27.3cm.). Figure 28 shows a records center type storage container of the knock-down variety made of corrugated cardboard. This container measures 5" x 9" x 18" (12.7 x 22.9 x 45.7cm.) and will hold twenty 35mm. boxes or thirty-two 16mm. boxes. Another container shown in Figure 29 is a fairly inexpensive file box which measures 8-5/8" x 10-3/4" x 4-1/8" (21.9 x 27.3 x 10.5cm.) and holds twelve 35mm. film cartons. This type of container is designed especially for storage on library shelving.

In metal equipment a Safe-T-stack file drawer (Figure 30) holds 39 rolls of 35mm. film and measures 4-1/4" x 12" x 23-3/8" (10.8 x 30.48 x 59.4 cm.). These may be stacked one on top of the other and locked together for safety. The stacks are self-supporting. Samples of larger and more expensive cabinets are shown in Figures 31 and 32.

If any archival repository is not completely fire-resistant and air-conditioned serious consideration should be given to the construction of a special vault for the storage of original negatives. The design, selection of materials, and construction of a vault should be handled only by a competent architect or engineer. The vault should be designed to withstand the effects of a severe fire. It should be constructed according to the governing building codes, fire underwriters' regulations, and it should meet requirements similar to those of the U. S. National Fire Protection Association.

There are two classifications of vaults according to the type of support: (1) ground supported vaults, and (2) structure supported vaults. Ground supported vaults are supported directly on the ground and, therefore, have strong independent structures. They are intended to give full protection even in the event of complete destruction of a building. Structure supported vaults are supported by the framework of a building and are, therefore, no stronger than the building itself.

Once the film is properly stored a few precautions are still necessary. If the storage temperature is below the dewpoint of the outside room air the film should be allowed to fully warm up in a closet container before being removed and used to prevent condensation of the moisture in the air. Periodic inspection of the film for unusual odors, mildew or mold, rusty spools, discoloration or fading, brittleness, and the presence of dust or powdery substances, buckled film or fluted edges, and microspots should be made on a sampling basis once every other year.

While reference prints do not have as great a value as the original negative their proper preservation is also important. The same humidity

and temperature conditions apply.

If the volume of reference activity on reference prints of microfilm is sufficiently high consideration shoud be given to the establishment of a central microfilm reading room. The supervisor in charge of this room can develope sufficient expertise to see that searchers are given efficient service and that the microfilm is protected against abuse. It is recommended that the supervisor thread the reader for the searcher and that he also remove the roll from the reader after the searcher has finished viewing it. Figure 33 shows a section of a central microfilm reading room.

VII. BIBLIOGRAPHY*

American Library Association. Microfilm Norms. Chicago, 1966. 48 p.

Avedon, Donald M. Glossary of Terms for Microphotography and Reproductions Made From Micro-images. Third Edition. The National Microfilm Association, Annapolis, Md., 1964. 67 p.

Ballow, Hubbard W. Guide to Microreproduction Equipment. Third Edition. National Microfilm Association, Annapolis, Md., 1965. 552 p.

Baudot, M. Perspectives D'Emploi du Microfilm dans les Dépots D'Archives. Archivum, 2; 89-92 Paris, 1951.

Belov, Gh. A. "National Programs for the Publication of Documents in Countries of the Eastern Hemisphere." English Version. 15 p. Paper prepared for the Extraordinary Congress of the International Council on Archives, Washington, D. C., May 9-13, 1966.

Binkley, Robert C. "New Tools for Men of Letters." Yale Review, New Series, Vol. 24, No. 3, p. 519, March, 1935.

Carter, Clarence E. Historical Editing. National Archives Bulletin No. 7, Washington, D. C., 1952. 51 p.

Eastman Kodak Company. Microfilming with Kodagraph Micro-File Equipment and Materials. Rochester, N. Y. 1952. 60 p.

Eastman Kodak Company. Storage and Preservation of Microfilms (Kodak Pamphlet P-108). New York, 1965. 10 p.

France. Archives Nationales. Etat Des Microfilms De Securite Conservés Aux Archives Nationales. Paris, 1962. 18 p.

Fussler, Herman. Photographic Reproduction for Libraries. Chicago, 1942. 218 p.

Gille, M. Bertrand. Equisse d'un Plan de normalization pour le microfilmage des archives. Archivum, 3; 87 p. Paris, 1953.

Great Britain. Public Record Office. Catalogue of Microfilm, 1967.

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*This bibliography is limited to materials consulted and is not intended to be comprehensive.

Hawken, William R. Copying Methods Manual. Chicago, American Library Association, 1966. 376 p.

Hawken, William R. Photocopying from Bound Volumes. Chicago, American Library Association, 1962.

Holmes, Oliver W. "National Documentary Publication Programming: Documentary Publication in the Western Hemisphere." 27 p. Paper Prepared for the Extraordinary Congress of the International Council on Archives, Washington, D. C., May 9-13, 1966.

International Microphotographic Congress. International Directory of Micrographic Equipment. International Micrographic Congress, Saratoga, Calif., 1967. 519 p.

Kish, Joseph L., Jr. and James Morris. Microfilm in Business. Ronald Press, New York, 1966. 163 p.

Leisinger, Albert H., Jr. Selected Aspects of Microreproduction in the United States. 41 p. Paper prepared for the Extraordinary Congress of the International Council on Archives. Washington, D. C., May 9-13, 1966.

Lewis, Chester M. and William H. Offenhauser. Microrecording: Industrial and Library Applications. New York, Interscience Publishers, 1956. 456 p.

Library of Congress. Specifications for Library of Congress Microfilming. By Stephen R. Salmon. Washington, D. C., 1964. 21 p.

McCamy, Calvin S. Inspection of Processed Photographic Record Film for Aging Blemishes. National Bureau of Standards, Handbook 96, Washington, D. C., 1964. 11 p.

National Historical Publications Commission. Catalog of Microfilm Publications. Washington, D. C., 1966.

Nelson, Carl E. Microfilm Technology: Engineering and Related Fields. New York, McGraw-Hill Book Company, 1965. 372 p.

Noll, Daniel F. The Maintenance of Microfilm Files. In the American Archivist, April 1950, p. 129-134.

Reunion Interamericana Sobre Archivos. Reproduccion de Documentos en Micropelicula. Prepared by Albert H. Leisinger, Jr., Washington, D. C., 1961. 32 p.

Sanchez Belda, Luis. Nuevos Métodos Técnicos, Nuevos Materiales y Nuevas Experencias en el Camp de la Restauración, Conservación, y Fotografía de Archivos desde 1950. Report presented to the Fourth International Congress of Archives, Stockholm. Madrid, 1961.

Schellenberg, Theodore R. "Microfilm Copying of Documents," Journal of the Society of Motion Picture Engineers, Vol. 27, No. 1, p. 90-93. July 1936.

Tate, Vernon D. and David R. Wolf. A survey of Microfiche Readers and Reader-Printers Currently Manufactured in the United States. National Microfilm Association Journal, Vol. 1, No. 1, Fall 1967. 17 p.

Tate, Vernon D. Microscopic Blemishes and the Storage of Permanent Record Microfilm, In Perspective. In National Micronews, No. 70, June 1964, pp. 241-248.

United States Air Force. Microfilming (Air Force Manual AFM181-3). Washington, D. C., 1959.

United States Bureau of Standards. Summary Report of Research at the National Bureau of Standards on the Stability and Preservation of Records on Photographic Film, by B. W. Scribner. (NBS Misc. Pub. M162). Government Printing Office, Washington, D. C., 1939. 7 p.

United States Department of the Army. Microfilming of Records. (Department of the Army Technical Manual 12-257). Government Printing Office, Washington, D. C., 1955. 91 p.

United States National Archives. Annual Reports, 1940-1949.

United States National Archives. List of National Archives Microfilm Publications. Washington D. C., 1961, 1965, 1966, 1968.

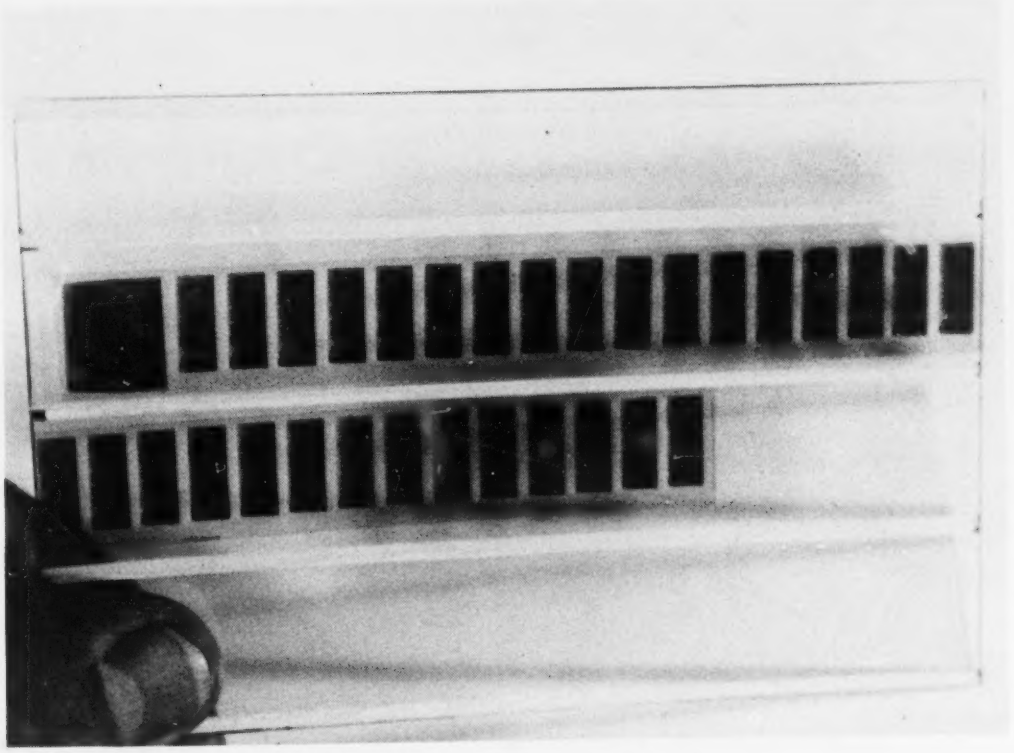
United States National Archives. Supplement to the List of National Archives Microfilm Publications, 1966. Washington, D. C., August 1967.

United States National Archives. Staff Information Paper No. 19. The Preparation of Records for Publication on Microfilm. Prepared by Albert H. Leisinger, Jr. Washington, D. C., 1951. 18 p.

United States Veterans Administration. Records Management Microphotography. (Veterans Administration Manual M3. 9). Washington, D. C., 1949. 41 p.

Verry, H. R. Document Copying and Reproduction Processes. Fountain Press, London, 1958. 328 p.

Wiest, D. G. and R. W. Henn. Microscopic Spots: A Progress Report. In National Micronews, No. 70, June 1964, pp. 249-264.



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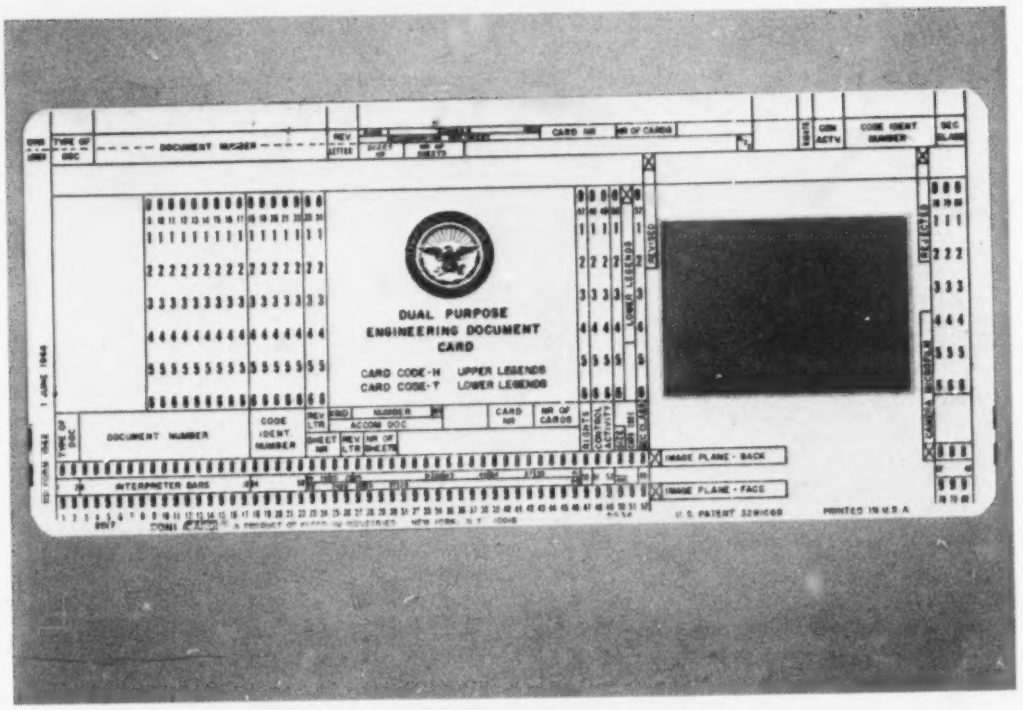

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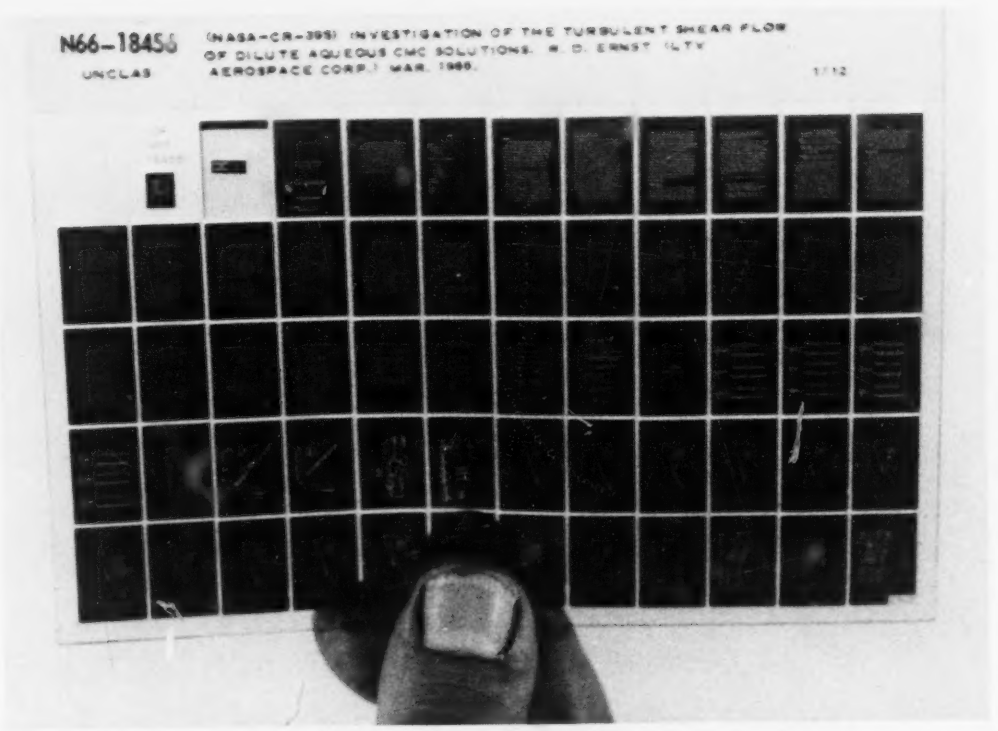
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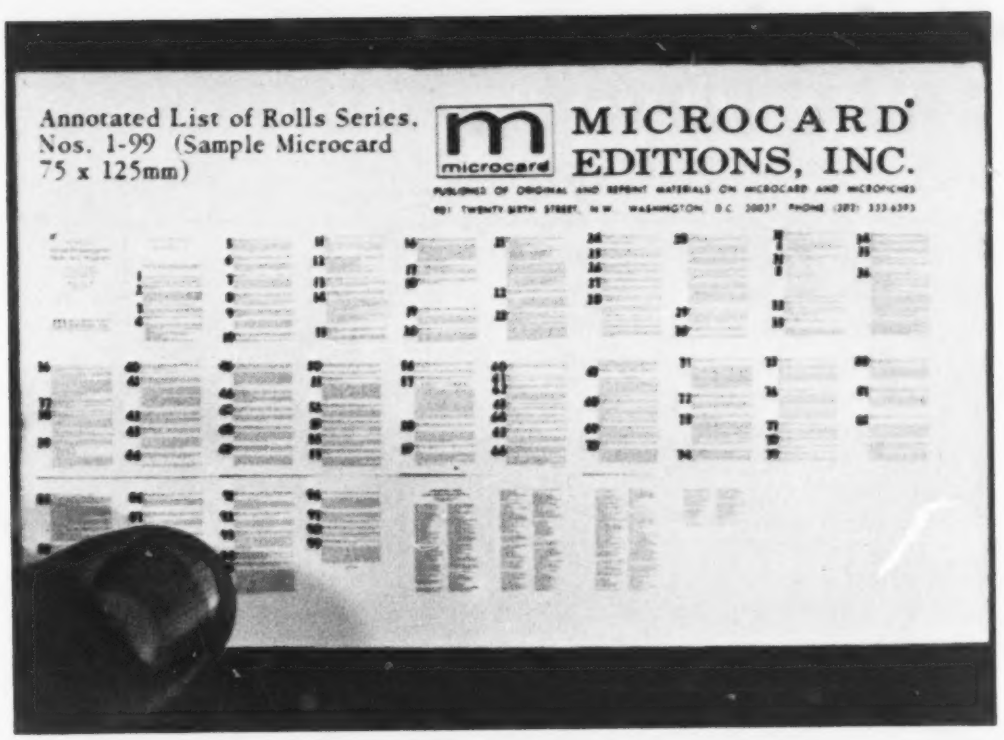
(NASA-CR-395) INVESTIGATION OF THE TURBULENT SHEAR FLOW OF DILUTE AQUEOUS CMC SOLUTIONS. R. D. ERNST (LTV AEROSPACE CORP.) MAR. 1966.
1/12

3. A microfiche



4. A microcard

Einstein's Collected Writings.
Part III: Selected Interviews.
Nos. 600-603. A.
(1945-1946)
Readex Microprint
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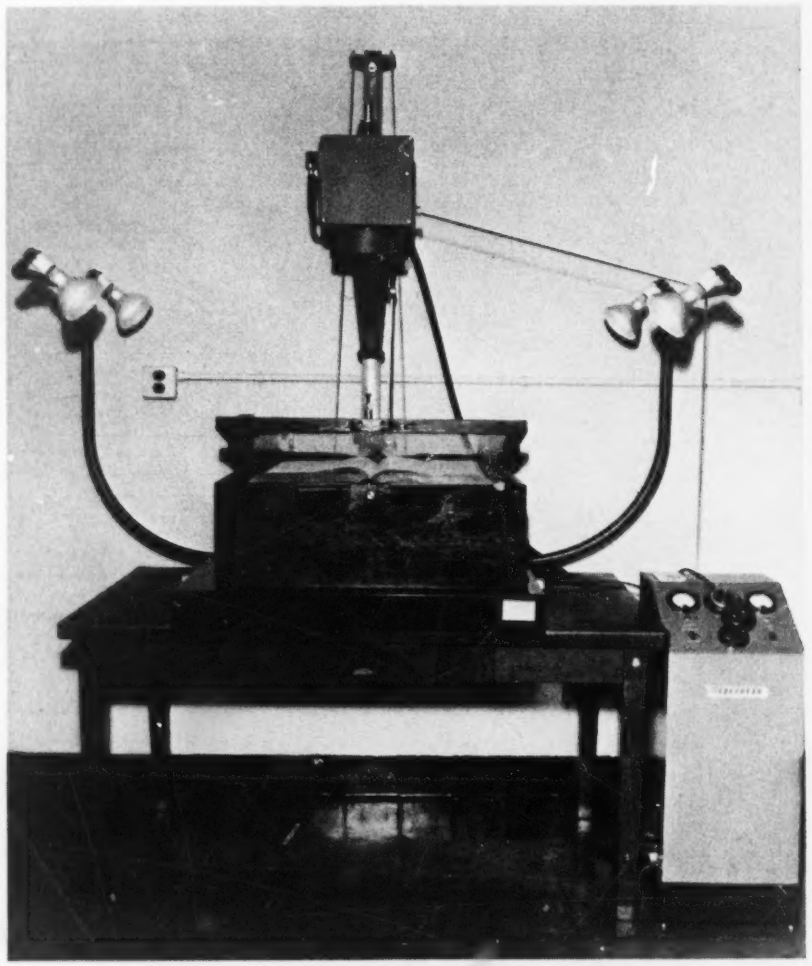
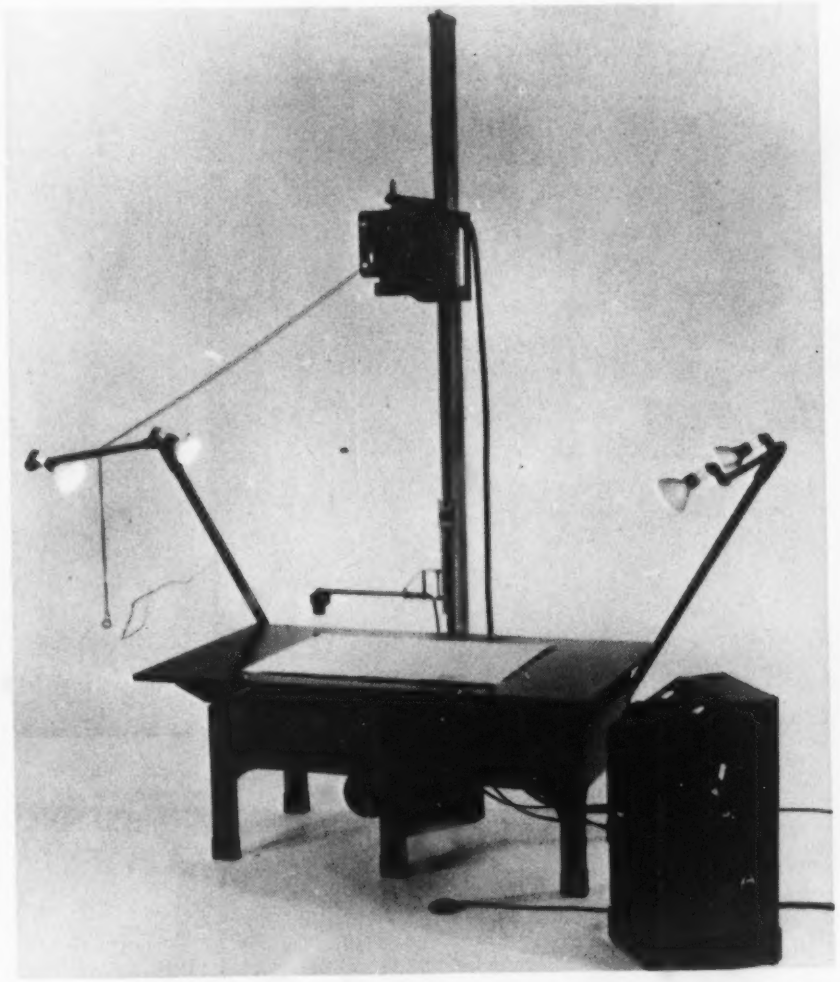
5. A microprint

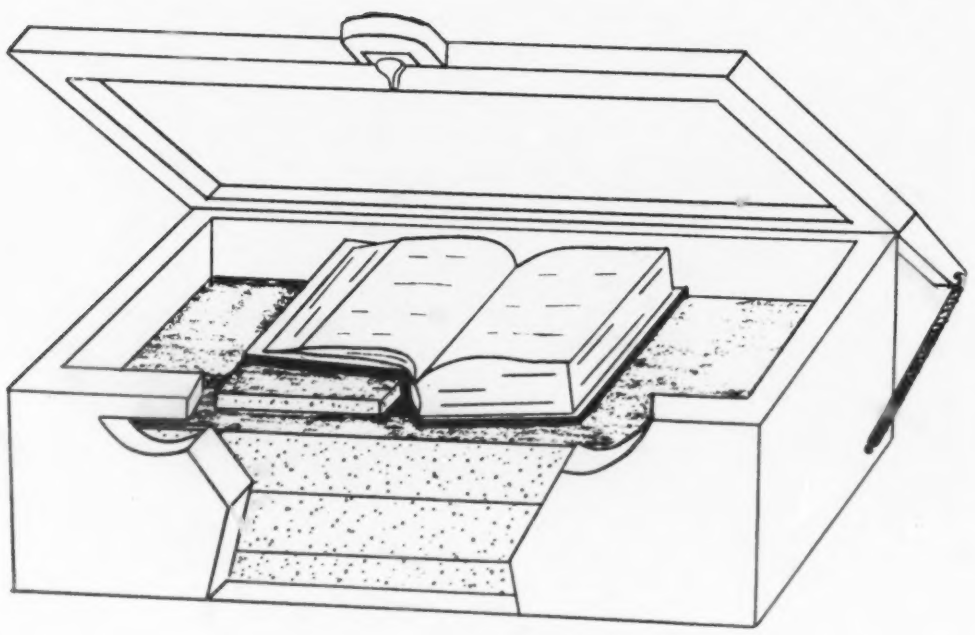


6. A flatbed camera

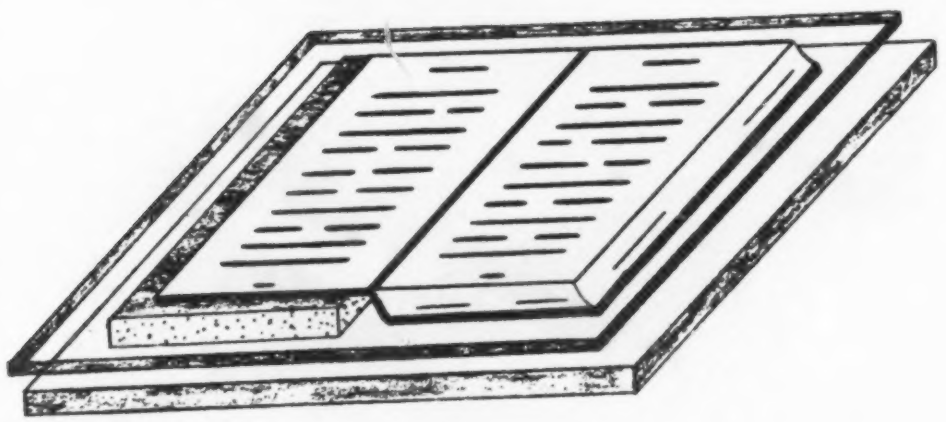


7. A flatbed camera

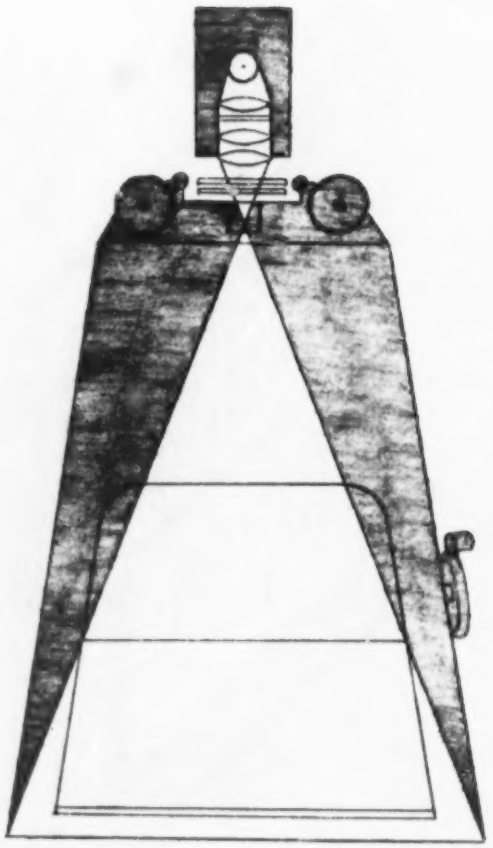
8. A rotary camera



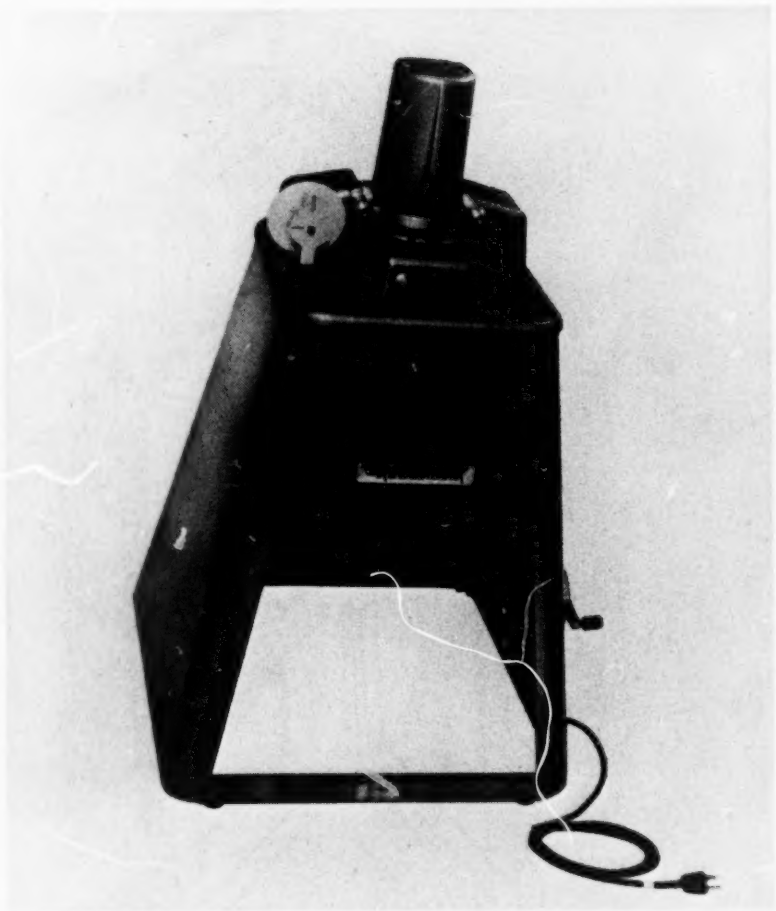
9. A book cradle



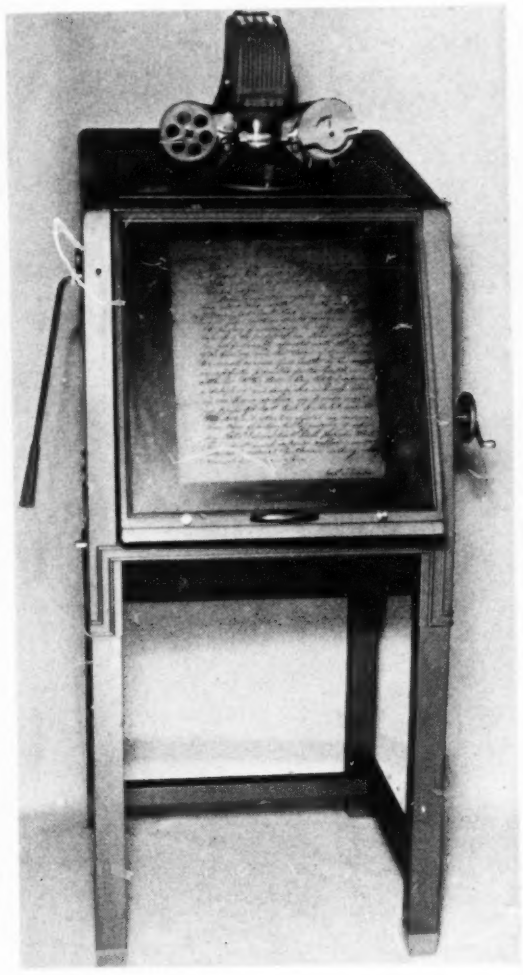
10. An improvised book holder



11. Light projection in a microfilm reader

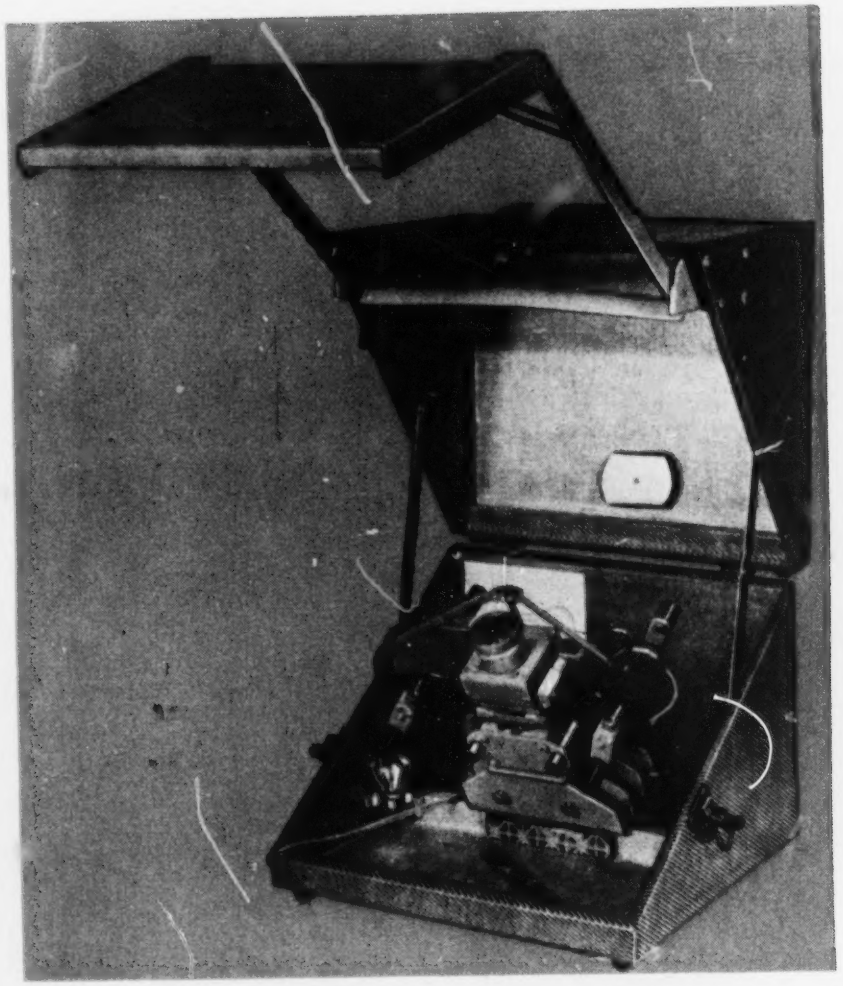


12. A microfilm reader (opaque reading screen)

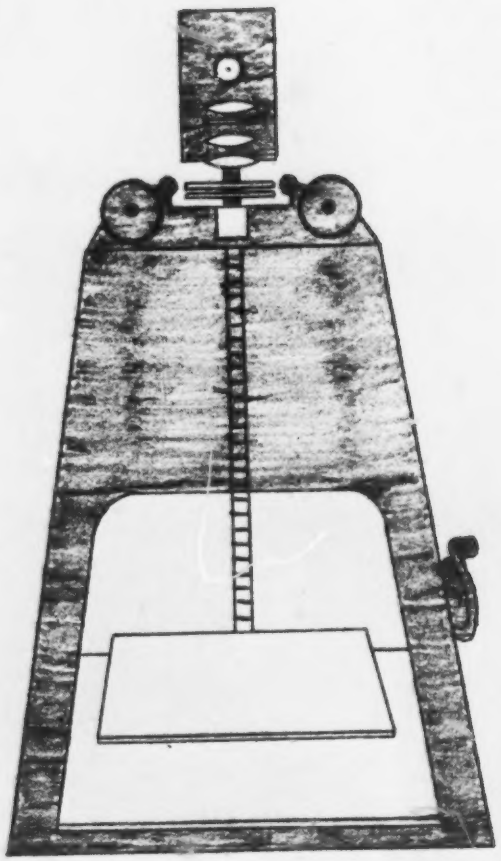


13. A microfilm reader
(translucent screen)

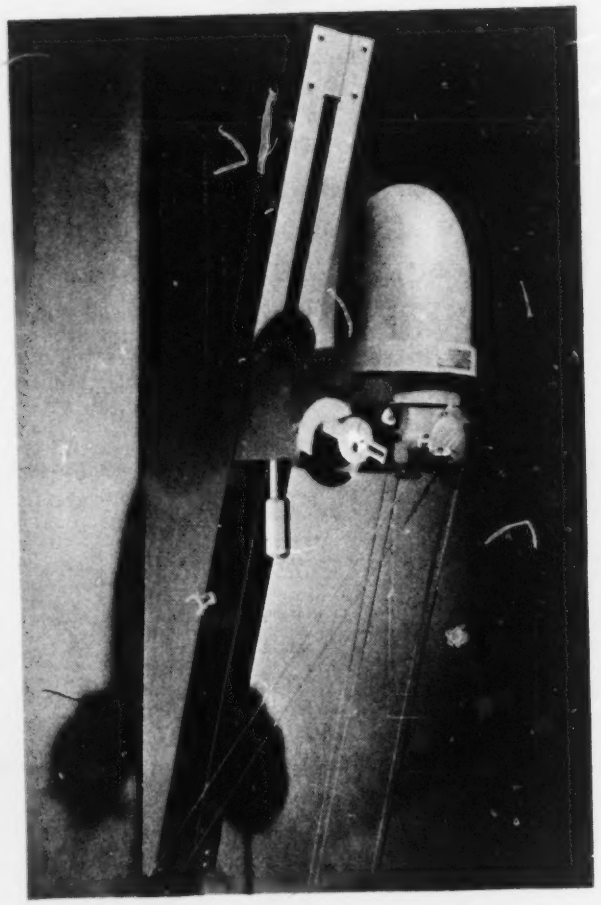
14. A motor-driven reader



15. A portable microfilm reader

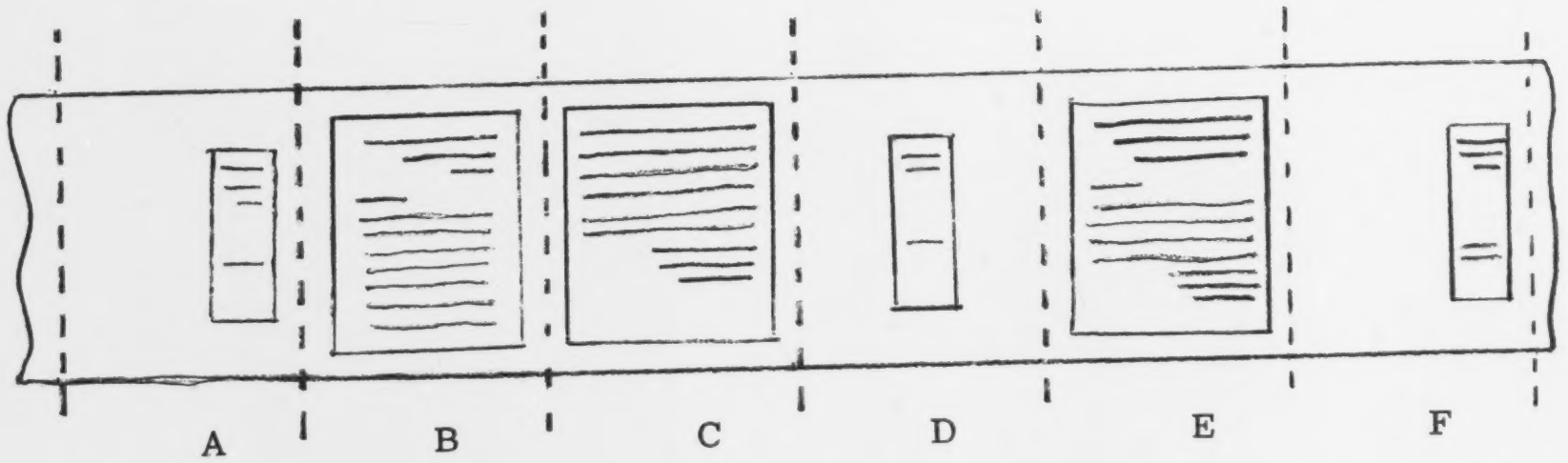


16. A reader adapted for the preparation of microprints



17. A microfilm enlarger

18. A reader-printer



A. When starting to film a folded document, film it unfolded endorsement side up on the right hand side of the camera's field

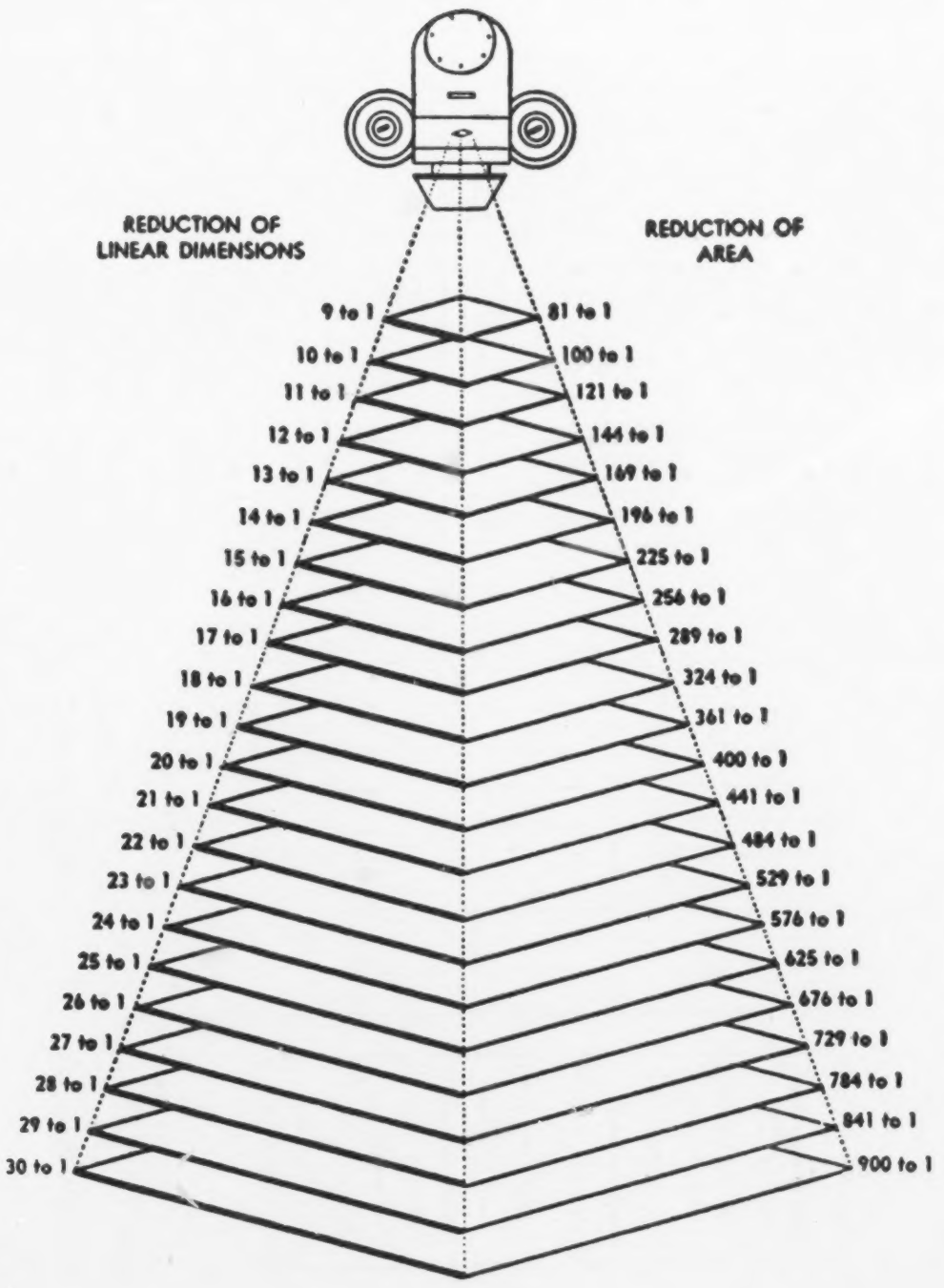
B&C. Unfold the document and film the pages in sequence as shown

D. If the document contains one or more enclosures, center each folded enclosure in the middle of the field

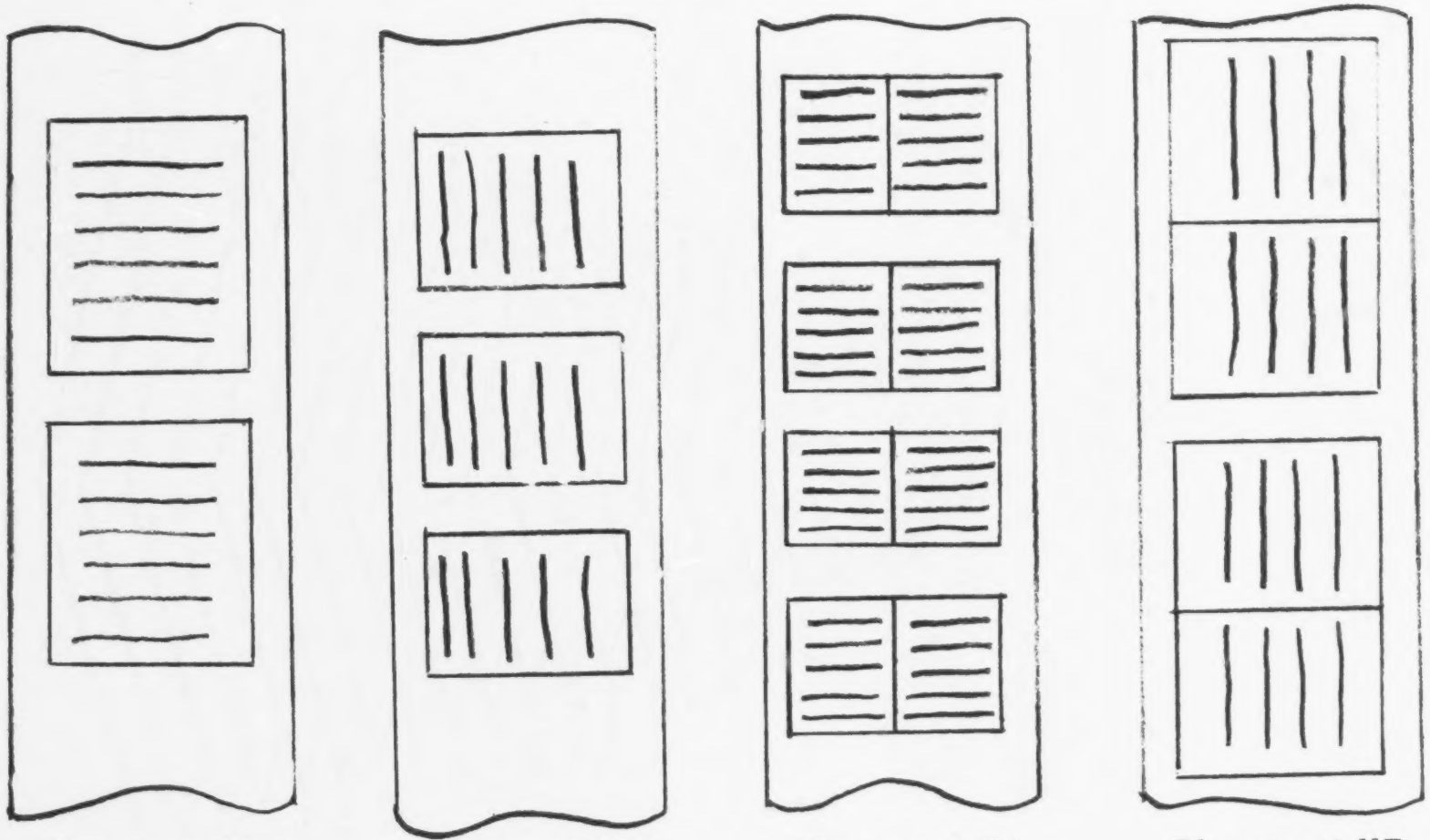
E. Unfold the enclosure and film the pages in sequence

F. Film the endorsement on the right hand side of the field

19. A method for filming folded documents



20. A graphic illustration of reduction ratio



Placement 1A Placement 1B Placement 11A Placement 11B

3. Standard Image Placements

NATIONAL ARCHIVES

Call No.	Micro-copy No. 97	Roll No. 1

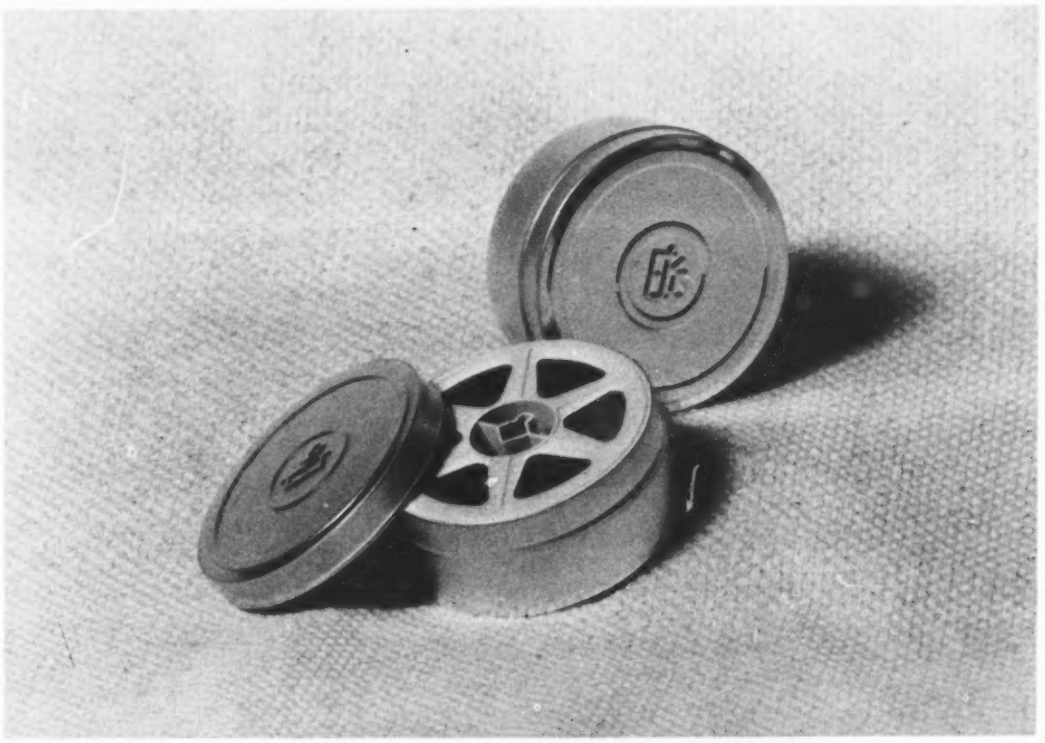
DESPATCHES FROM U. S. MINISTERS TO MEXICO, 1823-1906

Register, 1823-1906

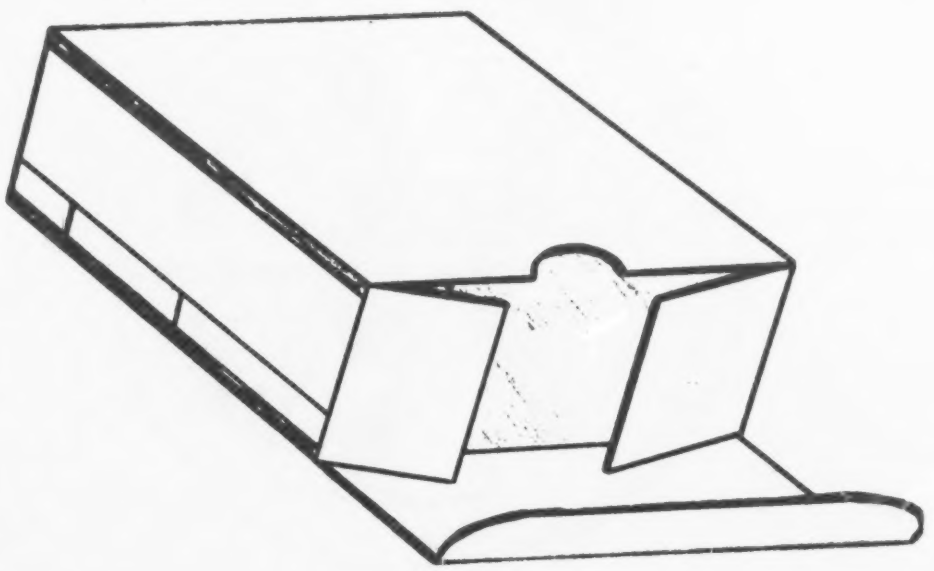
MICROFILM PUBLICATIONS

22. A sample label

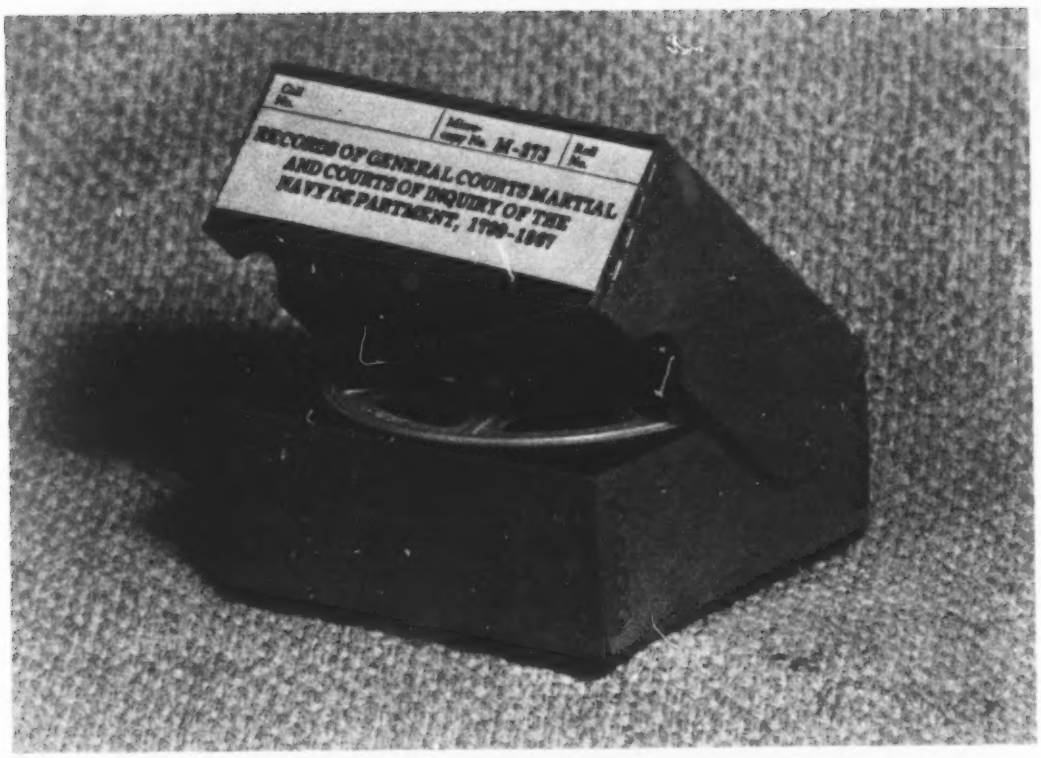
23. A universal reel



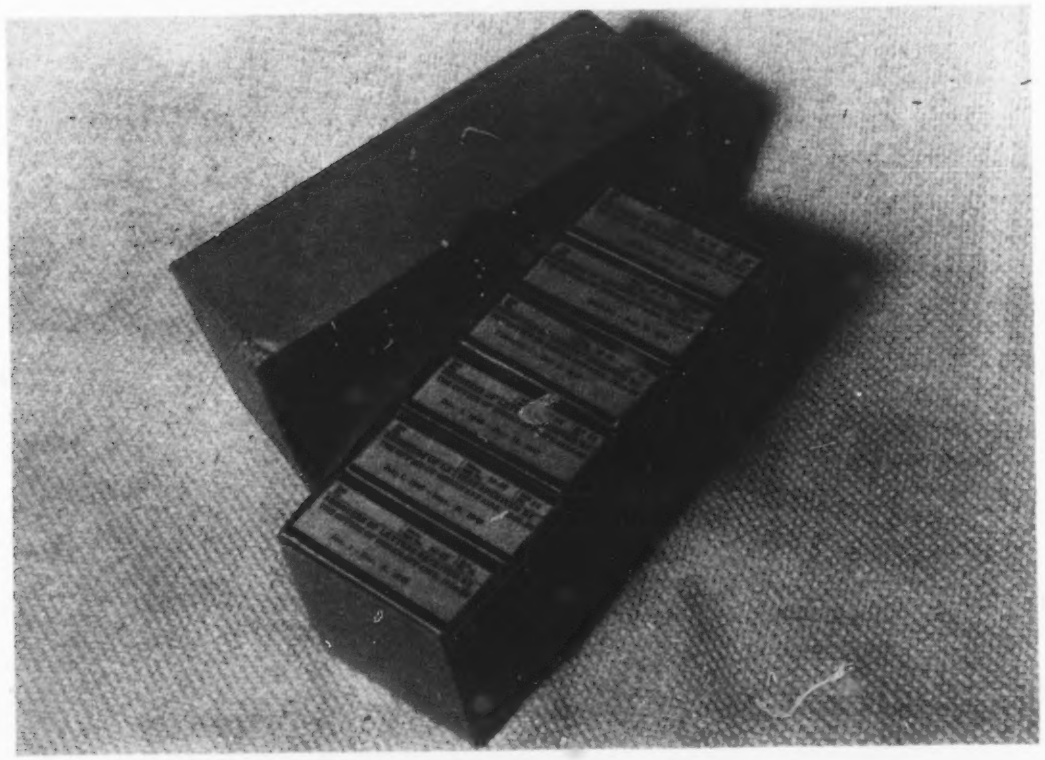
24. A metal reel container



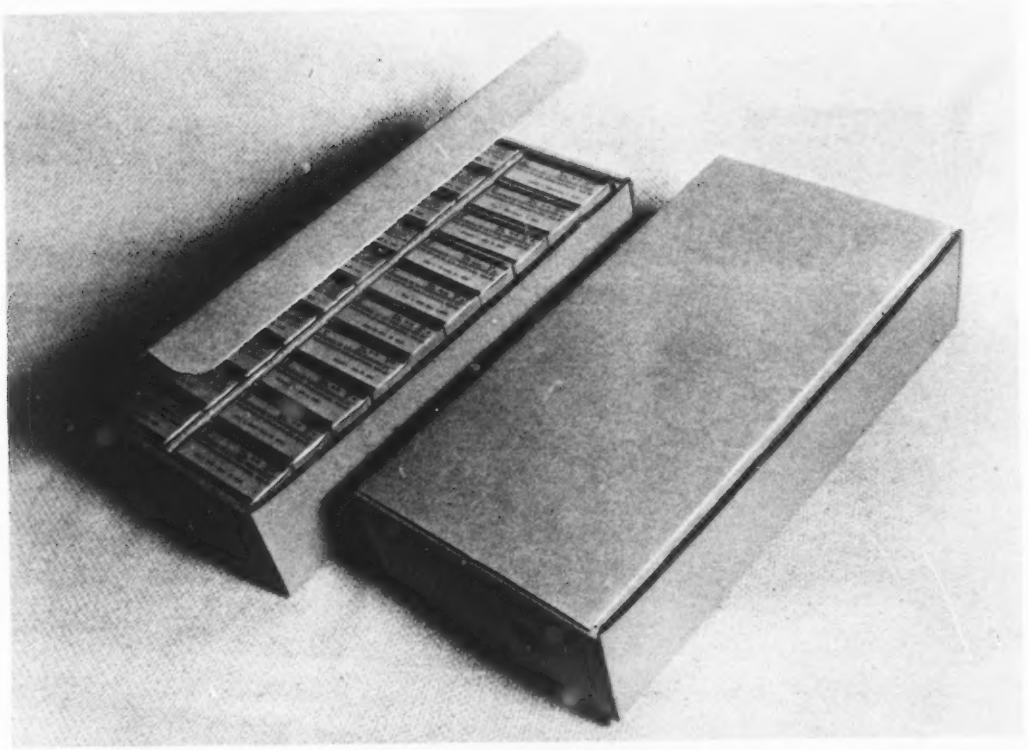
25. A cardboard microfilm carton



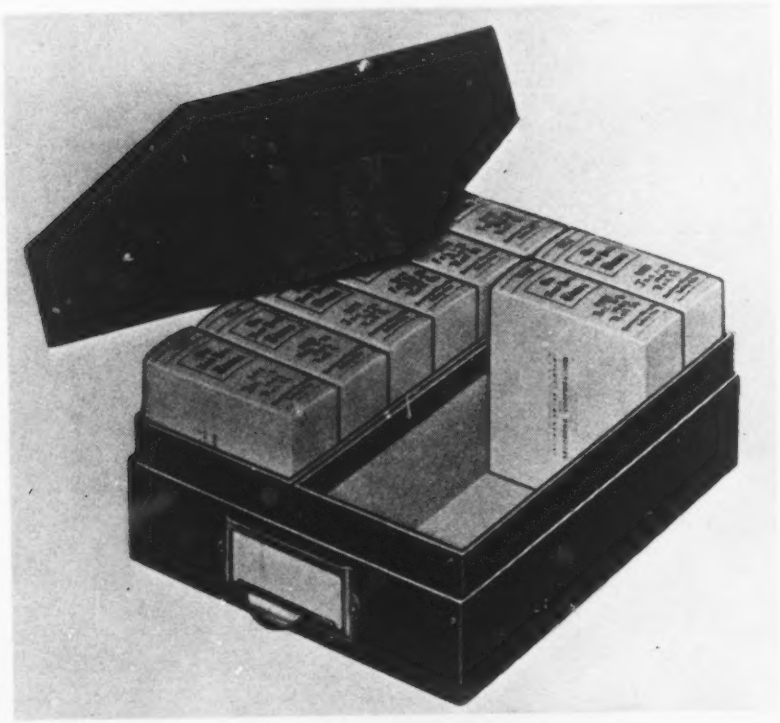
26. A clam-shell or hinged-lid box



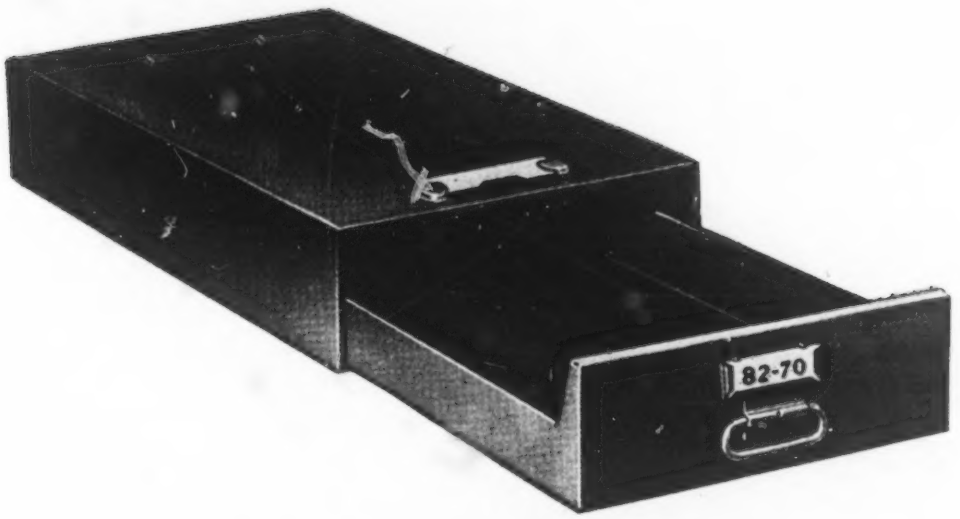
27. A metal-reinforced cardboard container



28. A records center storage container

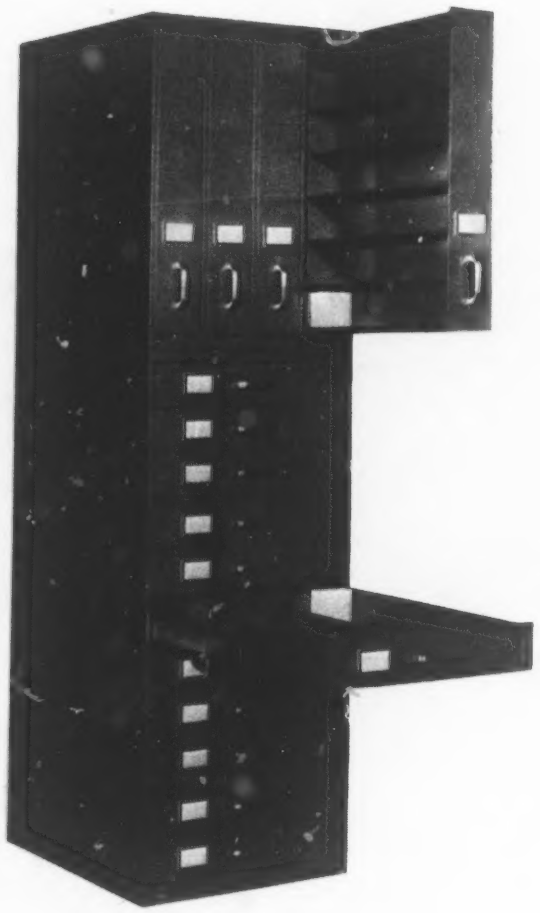


29. A microfilm file container

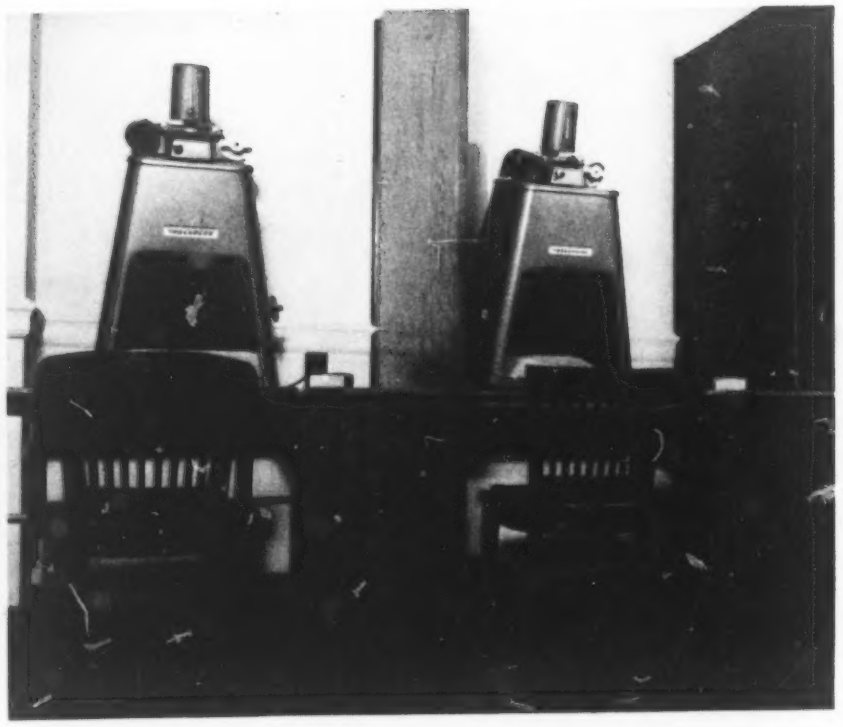


30. A metal Safe-T-Stack file drawer

31. A metal file cabinet



32. A metal file cabinet



33. A section of a central microfilm reading room